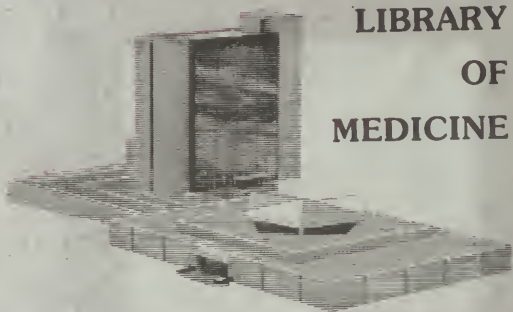




NLM 05109879 2

NATIONAL LIBRARY OF MEDICINE

**U.S. NATIONAL
LIBRARY
OF
MEDICINE**





DISEASES
OF THE
URINARY ORGANS.

DISEASES

OF THE

URINARY ORGANS:

INCLUDING

STRICTURE OF THE URETHRA,

AFFECTIONS OF THE PROSTATE, AND STONE IN THE BLADDER.

BY

JOHN W. S. GOULEY, M.D.,

LATE PROFESSOR OF CLINICAL SURGERY AND GENITO-URINARY DISEASES IN THE MEDICAL
DEPARTMENT OF THE UNIVERSITY OF THE CITY OF NEW YORK; SURGEON TO BELLEVUE
HOSPITAL; FELLOW OF THE NEW YORK ACADEMY OF MEDICINE; MEMBER
OF THE NEW YORK PATHOLOGICAL SOCIETY; OF THE MEDICAL
SOCIETY OF THE COUNTY OF NEW YORK, ETC., ETC.

WITH ONE HUNDRED AND THREE WOOD ENGRAVINGS.



NEW YORK:
WILLIAM WOOD & COMPANY,

27 GREAT JONES STREET.

1873.

Surgeon Genl's Office.
LIBRARY.
38542
Washington, D.C.

WdJ
G716 d
1873

Entered according to Act of Congress, in the year 1873, by
WILLIAM WOOD & CO.,
In the Office of the Librarian of Congress, at Washington.

POOLE & MACLAUCHLAN,
PRINTERS AND BOOKBINDERS,
205-213 *East Twelfth Street.*

To

THE MEMORY OF THE LATE

Charles Edwards Isaacs, M.D.,

AS

A TRIBUTE OF HIGH APPRECIATION

OF HIS

VALUABLE CONTRIBUTIONS TO ANATOMY AND SURGERY;

OF

GRATEFUL REMEMBRANCE OF HIS PRACTICAL AND SOUND INSTRUCTIONS;

AND

OF ESTEEM FOR HIS PERSONAL CHARACTER:

THESE PAGES ARE INSCRIBED

By the Author.

P R E F A C E.

THIS work is based on Lectures given at Bellevue Hospital, and in the Medical Department of the University of the City of New York, and embodies the results of the author's experience in private practice and in the public institutions with which he has been connected. He has endeavored to write a handy-book on the pathogeny, clinical history, and treatment of some of the graver surgical diseases of the male urinary organs, which he hopes may be of service to the practitioner, by pointing out means for their early detection; for lessening the difficulties of their management; and indicating, in cases of emergency, what to do and what to avoid.

Though the subject-matter is founded chiefly on personal observation, the claims and teachings of the many eminent men who have illustrated this department of surgery have not been overlooked.

56 WEST THIRTY-EIGHTH STREET, NEW YORK,
February, 1873.

CONTENTS.

PREFACE.....	vii
LIST OF ILLUSTRATIONS.....	xv
CORRIGENDA.....	xviii

CHAPTER I.

STRICTURE OF THE URETHRA, PATHOLOGY, SYMPTOMS AND SEQUELÆ.

Definition of stricture.—Causes.—Idiopathic stricture.—Pathology of stricture.—Bell's views.—Désormeaux's views.—No stricture without gleet.—Granular urethritis.—Forms and localities of strictures.—Number of strictures in one urethra.—Progress of stricture.—Symptoms.—Increased frequency of micturition.—Dysury.—Incomplete retention, with dribbling from overflow.—Complete retention.—Alterations in the urinary secretion.—Pathological lesions consequent upon neglected stricture.—Expansion of the urethra in the vicinity of strictures.—Urethral abscesses and fistulæ.—Rupture of the urethra, and extravasation of urine.—Rupture of the bladder.—Impairment of the generative functions.—Prostatitis and abscess of the prostate.—Acute and chronic cystitis.—Concentric hypertrophy of the bladder.—Ureteritis.—Pyelitis.—Hydronephrosis.—Pyonephrosis.—Constitutional disturbances.—Urinary neuroses.—Reflex paraplegia.....Page 1-17

CHAPTER II.

DIAGNOSIS OF STRICTURE.—CATHETERISM.—ACCIDENTS OF CATHETERISM.— URETHRAL FEVER.

Ducamp's exploring sound.—Civiale's wax bougies.—Bigelow's gutta-percha bougies.—Bell's ball probes or urethra sounds.—Leroy d'Etiolles' bougies-à-boule.—Phillips' bougies-à-nœuds.—Character and size of the urinary stream.—Microscopic examination of the urine.—Manner of using the bougie-à-boule.—The endoscope.—The urethroscope.—Cath-

eterism.—Curves of catheters.—Sounds and bougies.—Metallic catheters and sounds.—Conical sounds.—Sound gauges.—Manner of introducing sounds.—Accidents of catheterism.—False passages.—Urethral fever.—Suppression of urine.—Pathological lesions in suppression of urine.—Treatment of urethral fever.—Quinine.—Aconite.—Treatment of suppression of urine.....Page 18-40

CHAPTER III.

CONSTITUTIONAL AND SURGICAL TREATMENT OF STRICTURE OF THE URETHRA.—TREATMENT OF STRICTURE IN ITS INCIPIENT STAGE.—DILATATION IN SIMPLE CASES.—MANAGEMENT OF DIFFICULT CASES.

Preparatory treatment.—Pressure and over-distension by sounds, and direct applications to the diseased surface, in the incipient stage.—Instrument for over-distending the urethra.—Nitrate of silver solution in granular urethritis.—Sulphate of copper.—Treatment of simple cases of stricture.—Gradual dilatation.—Extent to which a stricture should be dilated.—Catheterism in eccentric strictures.—Benjamin Bell's bougie.—Leroy d'Etiolles' spiral bougies.—Capillary whalebone bougies.—Manner of introducing whalebone bougies.—The author's tunnelled sounds and catheters.—Caustics rejected by the best authorities.—Electrolysis...41-55

CHAPTER IV.

TREATMENT OF STRICTURE BY DIVULSION.

The term divulsion.—The mode of performing the operation.—Urethral dilators, their history.—The instruments of Luxmoor, of Weiss, of Perrève, and their several modifications.—The author's modification of Sir Henry Thompson's instrument.—Cases of stricture illustrative of the treatment by divulsion.....56-75

CHAPTER V.

INTERNAL URETHROTOMY.

Dr. Physick's and Mr. Stafford's lanceted stilettes.—Civiale's bistouri-caché.—Dr. Jameson's urethrotome.—Maisonneuve's, Voillemier's and Trélat's instruments, and their modes of operating.—The author's urethrotomes, and his mode of operating.—Dilating urethrotomes.—Cases illustrative of treatment of strictures by internal urethrotomy.....76-98

CHAPTER VI.

STRICTURES AT THE MEATUS URINARIUS AND IN THE FOSSA NAVICULARIS.
—THEIR NATURE, DIAGNOSIS AND TREATMENT.

Congenital variety.—Traumatic.—Chancrous.—Gonorrhœal.—Frequency of stricture at or near the meatus urinarius.—Pathological effects.—Diagnosis.—Treatment.—Free incision.—The operation.—After-treatment.Page 99-111

CHAPTER VII.

EXTERNAL PERINEAL URETHROTOMY.

History of external perineal urethrotomy.—Doctors Stevens and Jameson.—Improvements of Mr. Amott.—External perineal urethrotomy upon a conductor an ancient operation, is adopted by Mr. Syme in 1840.—Objections to Mr. Syme's staff.—The author's instruments and mode of operating.—Preparatory and after-treatment.—Accidents.—Results.—Cases illustrative of the operation.112-171

CHAPTER VIII.

TRAUMATIC LESIONS OF THE URETHRA.

Traumatic lesions of the urethra which are not followed by stricture.—Traumatic lesions which are followed by stricture.—Lesions of the urethra from internal injuries.—The arrest of gravel in the urethra.—Repeated contusions by bougies or catheters roughly used.—Transverse lacerations in the neighborhood of idiopathic strictures from forced catheterism, etc.—The prolonged retention of catheters in the urethra.—Loss of substance from gangrene, etc.—Caustics.—Lesions resulting from external violence.—Transverse incisions.—Lithotomy.—Lacerated wounds of the perinæum involving the urethra.—Torsion of the erect penis.—Breaking the chordee.—Contusion of the perinæum.—Period of formation of stricture after injury of the urethra.—Treatment of traumatic lesions of the urethra.—Treatment of traumatic strictures of the urethra.—External perineal urethrotomy in narrow traumatic strictures.172-214

CHAPTER IX.

RETENTION OF URINE.

Incomplete and complete retention of urine.—Retention of urine from inflammatory swelling in the urethra.—Retention of urine due to stricture of the urethra.—Treatment.—Case illustrative of.—Puncture of the bladder with capillary trocars and pneumatic aspiration.—Mr. Edward Cock's operation of tapping the urethra at the apex of the prostate unassisted by a guide staff.....Page 215-238

CHAPTER X.

RUPTURE OF THE URETHRA AND EXTRAVASATION OF URINE.—URETHRAL FISTULÆ.—RUPTURE OF THE BLADDER.

Rupture of urethra and extravasation of urine.—Effects upon surrounding tissues.—Treatment.—Free incisions.—Warm poultices.—External perineal urethrotomy.—Stimulants and concentrated food.—Urethral fistulæ.—Origin.—Treatment.—Dilatation or incision of strictured urethra.—Injections into fistulous tracts.—Incisions.—Constitutional treatment.—Urethro-rectal and urethro-recto-perineal fistulæ.—Treatment.—Ante-scrotal fistulæ.—Treatment by urethroraphy and urethroplasty.—Rupture of the bladder.—Cases illustrative of.—Causes of.—Dr. Stephen Smith's table.—Primary symptoms.—Progress of cases.—Results.—Post-mortem appearances of viscera.—Post-mortem appearances of bladder.—Prognosis.—Treatment.—Dr. Harrison's plan.—Dr. Walker's operation.....239-258

CHAPTER XI.

DISEASES OF THE PROSTATE.

Acute prostatitis.—Causes.—Symptoms.—Termination.—Peri-prostatitis.—Treatment.—Early evacitative catheterism.—Abscess opened by perineal incision.—Chronic prostatitis.—Causes.—Termination.—Symptoms.—Diagnosis.—Prostatorrhœa.—Treatment.....259-272

CHAPTER XII.

HYPERTROPHY OF THE PROSTATE.

Prostatic hypertrophy a disease of advanced life.—General and partial hypertrophy.—Centric hypertrophy.—Alteration of form.—Fibrous tumors of the prostate.—Obstructed micturition.—Involuntary flow of urine indicates retention, and not incontinence.—Consequences of unrelieved retention of urine from enlarged prostate.—Symptoms of hypertrophy of the prostate.—Diagnosis.—Exploration by the rectum and by the urethra.—Treatment.—Catheterism in enlarged prostate.—Treatment of chronic cystitis from enlarged prostate.—Muriate of ammonia.—Topical medication.—Manner of injecting the bladder.—Treatment of atony of the bladder.—Management of retention of urine from hypertrophied prostate.—Puncture of the bladder with capillary trocars.—Dieulafoy's aspirator.—The perineal operation.—Ablation of median prostatic outgrowths. Page 273-300

CHAPTER XIII.

STONE IN THE BLADDER.—LITHOTRIPSY.

Symptoms and constitutional effects of stone in the bladder.—Pathological effects.—Diagnosis.—Treatment preparatory to sounding.—Exploration with Thompson's sound and with light lithotripter.—Proper selection of operation.—Lithotripsy.—Civiale's early instruments.—Weisse's first curved lithotripter.—Heurteloup's curved percussor.—Jacobsen's brise-pierre articulé.—The modern lithotriptors.—Position of the patient during the operation.—Mode of introducing the lithotripter.—Seizure of the stone.—Fragmentation of the stone.—Mode of pulverizing fragments.—Impaction of fragments in the urethra.—Immediate removal of detritus.—Clover's aspirator.—Dittel's apparatus.—After-treatment.—Accidents of lithotripsy.—Results of lithotripsy 301-320

CHAPTER XIV.

LITHOTOMY.

Lithotomy in ancient times.—The Celsian operation.—Germain Colot.—The apparatus major.—Frère Jacques.—Rau.—Ledran.—Cheselden.—The lateral operation.—Frère Côme's lithotome caché.—Sir Cæsar Hawkins'

gorget.—Dr. Physick's gorget.—Dupuytren's double lithotome.—Dr. A. H. Stevens' prostatic bisector.—The lateral operation as now performed.—After-treatment.—Accidents of lateral lithotomy.—Allarton's median lithotomy.—The median operation as performed in the United States.—Medio-lateral lithotomy.—Dr. Buchanan's method.—Mr. Henry Lee's method.—Professor Briggs' lithotome.—Results of lithotomy. .Page 321-347

CHAPTER XV.

PERINEAL LITHOTRITY.

Dilatability of the vesical neck.—Dilatation by fluid pressure, according to Arnott's method.—Dr. Willis.—Lithectasy.—Dilatation by sponge tents.—Mr. John Douglas.—Professor Dolbeau's operation.—Small urethral incision.—Dolbeau's six-branched dilator.—Fragmentation of the stone.—Dolbeau's lithoclast.—The author's lithoclasts.—Extraction of the fragments.—Accidents of perineal lithotritry.—After-treatment.—Results of perineal lithotritry.348-364

INDEX. 365

LIST OF ILLUSTRATIONS.

FIGURE	PAGE
1. Diagram of a linear stricture.....	7
2. Diagram of an annular stricture.....	7
3. Diagram of a spiral or tortuous stricture.....	7
4. Olive-pointed bougie.....	20
+ 5. Leroy (d'Etiolles) bougie-à-boule.....	20
6. Bougie with a half olive.....	20
7. Bougie with two bulbs.....	20
8. Phillips' knotted bougie.....	20
9. Sir Chas. Bell's ball-probe or urethra sound.....	20
10. Diagram showing the manner of exploring the urethra with the bougie- à-boule.....	21
11. Diagram showing the manner of exploring the urethra with the bougie- à-boule.....	21
12. Désormeaux' Endoscope.....	22
13. Dr. Otis' urethral speculum.....	23
14. Conical sound with curve equal to three-tenths the circumference of a circle three and a quarter inches in diameter.....	26
+ 15. The author's metrical sound gauge.....	27
16. The author's metrical sound gauge.....	27
17. The author's instrument for over-distending the urethra.....	45
18. Diagram, from Boeckel, representing an eccentric stricture.....	50
+ 19. Benjamin Bell's abruptly bent bougie.....	51
+ 20. Leroy (d'Etiolles') spiral bougie.....	51
21. The author's tunnelled sound with a whalebone bougie in position.....	53
22. Tunnelled gum catheter.....	54
+ 23. Dr. Otis' dilating catheter threaded upon a whalebone bougie.....	55
24. Holt's modification of Perrève's divulsor.....	58
25. Voillemier's modification of Perrève's divulsor.....	58

FIGURE	PAGE
26. The author's modification of Thompson's divulsor.....	60
27. From nature, showing longitudinal rent in the floor of the urethra after divulsion.....	65
28. Dr. Jameson's urethrotome.....	77
29. Maisonneuve's urethrotome.....	79
30. Voilemier's urethrotome.....	79
31. Civiale's urethrotome.....	81
32. Civiale's bistouri-caché.....	81
33. Charrière's urethrotome.....	81
34. Trélat's urethrotome.....	81
35. The author's tunnelled urethrotome.....	86
36. Flexible bougie tied in a knot.....	88
37. The author's improved tunnelled urethrotome.....	91
38. Civiale's bistouri-caché.....	106
39. Diagram showing the manner of incising a stricture of the fossa navicu- laris with a double instrument.....	107
40. Congenital hypospadias and stricture.....	108
41. The author's meatotome.....	109
42. Diagram showing the manner of applying the dressings after division of the meatus urinarius.....	110
43. Diagram showing the dressings applied.....	110
44. Syme's grooved staff for external urethrotomy.....	122
45. A. The author's catheter staff with whalebone guide in the terminal canal.—B. Catheter staff showing the eye on the concave side.—C. Small grooved silver probe with broad handle.—E. Small hook for catching the loop of silk.....	123
46. F. The author's grooved and tunnelled catheter staff.—G. Showing the groove on the bridged portion.—H. Same, showing spiral bougie in position.....	124
47. The author's beaked bistoury.....	125
48. From nature, showing cicatrix obliterating the urethra.....	178
49. Same, showing artificial external urethral orifice in perinæum.....	179
50. Vesical extremities of whalebone probe-pointed bougies.....	225
51. The author's tunnelled catheter for retention of urine.....	225
52. The author's tunnelled sound.....	226
53. Hutchison's catheter for applying ointments to the urethra.....	271
54. Catheter for injecting nitrate of silver in the prostatic sinus.....	271
55. Bigelow's catheter syringe.....	271

FIGURE	PAGE
56. Sir Henry Thompson's exploring sound.....	283
57. Over-curved gum instrument for catheterism in cases of centric hypertrophy of the prostate.....	285
58. French olivary gum catheter.....	287
59. India-rubber bag for injecting the bladder.....	289
60. The vertebrated catheter, Dr. Caro's model.....	292
61. Dieulafoy's aspirator.....	294
62. The author's écraseur for the ablation of median prostatic valvular outgrowths.....	299
63. Sir Henry Thompson's exploring sound.....	303
64. The vesical extremity of the trilabe and perforator, such as Civiale used in his early operations, showing a perforated calculus within the grasp of the instrument.....	308
65. First model of Weiss' lithotripter.....	308
66. Jacobsen's brise-pierre articulé closed.....	309
67. Same, open for seizure of the stone.....	309
68. Beak of fenestrated lithotripter.....	311
69. Plain-bladed lithotripter.....	312
70. Handle of Charrière's lithotripter.....	312
71. Handle of Weiss' improved lithotripter.....	313
72. Mathieu's urethral forceps closed.....	317
73. Same, open for seizure of a fragment.....	317
74. Frère Côme's lithotome caché.....	324
75. Dr. Physick's gorget.....	325
76. Lithotomy staff.....	326
77. Lithotomy knife.....	326
78. Beaked knife.....	326
79. Sir William Blizard's beaked bistoury.....	327
80. Straight plain-bladed lithotomy forceps.....	327
81. Curved lithotomy forceps.....	327
82. Lithotomy scoop.....	328
83. Reduced in size from Dr. Little's paper on median lithotomy, showing the staff held in position, the left index, in the rectum, resting against apex of prostate, and the knife plunged in the membranous portion of the urethra.....	339
84. Dr. Markoe's staff.....	340
85. Dr. Little's staff.....	340
86. Dr. Little's director.....	341

FIGURE	PAGE
87. Reduced in size from Dr. Little's paper, showing the director in position, and the right index entering the prostatic portion of the urethra	341
88. Professor Briggs' lithotome.....	343
89. Dolbeau's dilator, reduced in size.....	351
90. Dolbeau's dilator, natural size.....	351
91. Dolbeau's dilator, branches expanded.....	351
92. From Dolbeau, showing the relative positions of the staff and dilator during the first step of dilatation.....	353
93. From Dolbeau, showing the relative positions of the staff and dilator during the second step of dilatation.....	354
94. From Dolbeau, showing the third step of dilatation.....	355
95. Dolbeau's lithoclast, reduced in size.....	357
96. Dolbeau's lithoclast, vesical end, natural size.....	357
97. The author's lithoclast, reduced in size.....	359
98. The author's lithoclast, vesical end, natural size.....	359
99. The author's lithoclast, the jaws open for seizure of the stone.....	359
100. The author's curved lithoclast.....	361
101. From Dolbeau, showing the lithoclast in position, with a calculus between its jaws.....	362
A. Dr. Otis' dilating urethrotome.....	94
B. The author's dilating urethrotome.....	97

CORRIGENDA.

P. 23, Fig. 13, for Otis's, read Otis'.

P. 94, Fig. A. for Peters's, read Peters'.

P. 177, eighth line from foot, for a spicula, read spicula.

DISEASES OF THE URINARY ORGANS.

CHAPTER I.

STRICTURE OF THE URETHRA.

PATHOLOGY, SYMPTOMS, AND SEQUELÆ.

THE term stricture—from *stringere*, to bind—when applied to the urethra, is understood to indicate a permanent morbid condition of the walls of the canal, generally causing a progressive diminution of its calibre. It is due to inflammation, loss of substance, direct injury, or congenital malformation. Its immediate effect is to impede the flow of the urine.

Many authors admit three kinds of stricture: permanent, spasmodic, and inflammatory. If, however, the term stricture be used in its correct sense, there can be but one kind—the permanent. Spasm of the urethra is doubtless of very frequent occurrence, but does not, properly speaking, constitute stricture, and not a few modern writers have justly noted this distinction. Yet it must not be overlooked that in true stricture—the permanent organic change in the tissues—there is often a very decided tendency to spasm, and that inflammatory swelling, sufficient to cause retention of urine, not unfrequently occurs, in an already constricted canal, or as the effect of exposure and debauch during an attack of gonorrhœa. But neither of these troubles, by itself, comes within the above definition.

It is most common in early manhood and in middle life. The

greatest number of cases—proportioned to the inhabitants—happen in large cities. It is said to occur more frequently in hot than in cold climates. Persons of nervous temperament, of gouty or of strumous diathesis, and all those given to venereal and other excesses, are particularly liable to suffer from the malady.

Stricture may be idiopathic or traumatic, and it is proper to consider these two classes separately.

Causes.—Idiopathic stricture, while sometimes congenital, is, in the vast majority of cases, the product of urethritis. At one time this view was rejected on the ground that only a minority of the patients attacked with gonorrhœa ever suffered from stricture.

Injections.—Those who entertained this opinion denounced the injections employed against urethritis as the cause of stricture; this method of treatment was consequently discontinued by many, but stricture still occurred in patients otherwise treated. The truth is, that injections are seldom *per se* a cause of stricture; they sometimes assist to produce that result by aggravating and prolonging the already existing inflammation, as would almost any other irritant; yet if a strong solution of nitrate of silver be used, as in the so-called abortive treatment of gonorrhœa,—which is happily falling into disuse,—the most violent and obstinate inflammation will probably occur, and then stricture will surely ensue. Such strong solutions incautiously employed in spermatorrhœa may produce the same result, and these are fairly to be credited with the entire causation of the stricture.

Improper Use of Instruments.—The too frequent and careless introduction of bougies and catheters sometimes causes a urethritis which ends in induration and narrowing of the canal, often to a very considerable extent.

Other Irritants.—Besides venereal urethritis and the causes already mentioned, almost anything that will occasion and maintain urethral inflammation will sooner or later develop stricture;

for instance, masturbation ; frequent and prolonged erections of the penis ; the habitual ingestion of substances which render the urine acrid, such as cantharides, turpentine, beer, the sparkling wines, ardent spirits, etc. Those who indulge immoderately in such excitants are apt to suffer from a sub-acute urethritis, which, when neglected, almost always ends in stricture.

PATHOLOGY.

The inquiry into the mode of formation and development of stricture resulting from urethritis is of interest and importance. The pathology of this disease seems to have been unknown to the ancients, for we find the old authors citing cases of retention of urine caused by what they called "excreescences," "caruncles," "carnosities," "callosities," in the urethra.

The existence of these "caruncles" was not doubted until Dionis called it in question, saying that, in many dead bodies of persons supposed to have suffered from "carnosities," which he had carefully examined, no trace of these so-called excreescences was found ; but the trouble was recognized to be narrowing or stricture of the urethra, caused by "cicatrization of ulcers from gonorrhœa." * Other contemporaneous surgeons came to the same conclusion ; but, in spite of this declaration, based upon extended observations, the erroneous doctrine of "carnosities" prevailed for many years.

Benjamin Bell, one of those who afterwards combated this theory, and helped to establish what is now looked upon as the correct view of the subject, says : "In the more fixed kinds of obstruction proceeding from gonorrhœa, the diameter of the urethra is lessened in two different ways. For the most part it is diminished by a thickening taking place at some particular

* Dionis. Cours d'opérations de chirurgie. 5ème édit. Paris, 1765. p. 272.

point in the membrane of the passage itself, or rather in the corpus spongiosum urethræ, in a similar manner to what frequently happens in the membrane of the nose in cases of catarrh. At other times the urethra is drawn together or contracted, as if a cord were tied round it, without any other disease being perceptible." "In some cases, again, these two affections are conjoined." *

Mr. Bell's views hold good to-day, for it is clearly proved that the mucous membrane, submucous tissue, and the spongy substance are involved ; sometimes one, sometimes another, and often all three.

Thanks to our modern modes of exploration, we are now better able to study the disease in all its stages during life. Mr. Désormeaux, who has done so much toward improving our knowledge of the pathology of stricture, says that "if we consider urethritis, and the consequent stricture of the urethra, as a single affection, whose evolution begins at the moment of contagion and continues to the organic stricture, we are led to recognize, in the progress of this ailment, three different epochs, to each of which belongs a particular kind of stricture. The first epoch is that of the urethritis, or of the acute inflammatory stricture. The last epoch answers to the confirmed, fibrous, or inodular stricture. Between these two extremes is an intermediary epoch which originates in the first and prepares the third." † In this middle period he discovered with the endoscope a localized inflammation with granulations, and named it granular urethritis.

Simple urethritis affects the mucous membrane alone ; and if it becomes chronic, and is neglected, the consequent stricture will, in the great majority of instances, be of slow progress, or even

* Benj. Bell on *Gonorrhœa Virulenta*, etc. Edin. 1793. Vol. i., pp. 258, 259.

† Désormeaux. *De L'Endoscope et de ses applications au diagnostic et au traitement des affections de l'urèthre et de la vessie*. Paris, 1865, p. 83.

stand absolutely still for an indefinite period.* But when the urethral inflammation is very severe, these cases being marked by chordee, it involves the submucous tissue, and sometimes even extends to the spongy substance, and an inodular stricture very soon ensues.

No Stricture without Gleet.—It frequently happens that, in acute urethritis, there is a very considerable tumefaction of the mucous membrane, with spasm of the urethral muscles, to the extent of causing retention of urine; this has been improperly termed “acute inflammatory stricture.” The swelling and spasm are an obstacle to the emission of urine, but these soon subside under rest and appropriate treatment, and leave no traces of stricture. If the urethritis be cured without passing into the chronic stage, with gleet, there will probably be no stricture. Very frequently the first, second, or even the third clap yields to treatment, and escapes chronicity; otherwise every infected patient would suffer from stricture sooner or later, which, we know, is not the case.

Chronic urethritis may continue many years without giving rise to any annoyance, other than a slight discharge of muco-pus, —called *blennorrhœa*, or gleet,—which in most cases has been demonstrated to be due to a granular condition of the urethra at one or more points on its mucous surface; the granulations being similar to those often seen on the palpebral conjunctiva.

Formative Stage of Stricture.—Granular Urethritis, in accordance with the views of Mr. Désormeaux, which I believe to be correct in the main, is the formative stage of stricture; it is the “intermediary epoch which prepares the third epoch, or that of the confirmed stricture.” This chronic inflammation, if allowed to progress, ends by destroying the mucous glands, and the mem-

* On Very Wide Stricture of the Urethra. By Z. E. Lewis, M.D. *Medical Record*, vol. iv., No. 12, August 15, 1871.

brane loses its identity; its epithelial investment soon ceases to afford any protection against the irritating urine, as most of the cells are cast off before they are fully developed, and pass away as pus-corpuscles.*

Second Stage.—After a while there is cell-proliferation in the meshes of the mucous membrane, and also in the submucous connective tissue. The protoplasts may multiply so rapidly as to give rise to swelling, and consequent diminution of the calibre of the canal; this state is termed by Mr. Désormeaux, “chronic inflammatory stricture.”

Third Stage.—In time the new cells are transformed into fibrils, after which retraction takes place as in the tissue of cicatrices, and then the true organic or inodular stricture is developed.† It should be remembered that, in idiopathic stricture, the mucous membrane, the submucous tissue, the spongy substance, or all three, may be involved; points of no little importance in connection with the question of treatment.

Forms and Localities of Strictures.—For practical purposes, three forms of strictures may be distinguished: the linear

* Mr. Alphonse Guérin denies the existence of granulations upon the mucous surface in chronic urethritis; but his conclusion is based upon examinations after death, and not with the urethroscope.

† In a paper on the Pathogenesis of Strictures and the Minute Anatomy of the Urethra, Dr. Stilling, of Cassel, pronounced the penis to be an organic muscle, and the process of erection the result of arterial hyperæmia, and not of venous congestion. According to his microscopic examinations, the corpora cavernosa are composed entirely of organic muscular fibres, which surround the arterial ramifications, and divide the sinuses by means of septa; these sinuses themselves are nothing more than the dilatations of the capillary branches of the arteria dorsalis penis, and open respectively into capillary branches of the veins of the penis. The organic muscular fibres pass into the mucous membrane of the urethra, and thus give contractility to the canal. An inflammation of the urethra causes a degeneration of these muscular fibres in a greater or less degree, and thereby the contractility and diameter of the canal become impaired.—*American Journal of Syphilography and Dermatology*, July, 1872. Quoted from the Transactions of the First Annual Congress of German Surgeons, April, 1872.

(Fig. 1), the annular (Fig. 2), and the spiral or tortuous (Fig. 3).

The linear stricture is due to the contraction of a narrow cic-



FIG. 1.



FIG. 2.



FIG. 3.

atricial band, which gives rise, by a duplicature of the mucous membrane, to a thin diaphragmatic septum, sometimes with a central, often with an eccentric orifice, and occasionally not involving the whole calibre of the canal, but forming a valvular crescentic fold. The most unusual and extreme variety of this form of stricture is found in the transverse bands or bridles which are now and then found in the urethra.

In the annular or hour-glass form there is a constriction as if a cord were tightly tied round the canal, and the stricture may occupy more or less of the urethra, even to nearly its whole extent,* but seldom exceeds five-eighths of an inch in length. Here also the orifice is either central or eccentric; but the latter is much more common than is generally supposed, and is often a source of great difficulty in passing instruments, as will appear when the subject of difficult catheterism is discussed.

The spiral or tortuous form is of very frequent occurrence, and its devious course is due to irregular contraction of the stric-

* Sir Chas. Bell, Leroy d'Etiolles, Mr. Lizars, and many others have seen nearly the whole spongy portion of the urethra tightly constricted. Case XV. Chap. V. is an example of this kind.

ture tissue. It is ordinarily from half an inch to an inch in length.

Strictures of all the varieties may be met with in different stages, and these stages have sometimes been mistaken for distinct forms of the disease. Strictures of recent and rapid formation are generally soft and yielding as compared with those of slow growth or long existence; and the induration of the latter may be increased by certain concurrent circumstances. When the spongy tissue is involved, especially when chordee has accompanied the urethritis, the induration is likely to be extreme, and may be easily discovered by palpation.

Another fact, noteworthy here, and having an important bearing upon treatment, is that the stricture tissue is usually more pronounced, more abundant, in the floor of the urethra than elsewhere.

The Favorite Localities of idiopathic strictures of the urethra are: 1st, in the sinus of the bulb; 2d, at or near the external orifice; 3d, in the space between the anterior extremity of the bulb and the peno-scrotal junction; and 4th, in the pendulous portion, or rather in that part of the canal which is included between the base of the glans and the peno-scrotal junction. Stricture is very rarely found in the membranous, and its existence in the prostatic portion is denied by the best authors.

In an examination of two hundred and seventy preparations, exhibiting three hundred and twenty strictures, Sir Henry Thompson found that the constrictions in the region of the bulb were sixty-seven per cent. of the entire number; sixteen per cent. were found in the region included between the bulb and a point two and a half inches from the external orifice; and seventeen per cent. in these anterior two and a half inches, including the external meatus.

Number.—Multiple strictures are of more common occur-

rence than is generally believed, as most surgeons of experience in this branch will testify ; occasionally, however, the number of constrictions in the single urethra is great, if we have faith in the evidence of Hunter, who has seen six in one urethra ; of Lallemand, who mentions seven ; of Colot, eight ; and of Leroy d'Etiolles, who has discovered eleven by means of the gum "*bougie-à-boule*." It is rare to meet with more than three ; in three instances, however, I detected, with the *bougie-à-boule*, four in the single urethra, the first being at the external orifice, and the others following with intervals of about one inch. Very frequently there are two ; one at or near the meatus, and the other in the spongy portion, commonly in the region of the bulb.

The Progress of idiopathic stricture, as a general rule, is not very rapid ; most of the aggravated cases we observe are of from five to ten years, or even longer duration ; sometimes the disease makes still slower headway, and remains, as it were, dormant for many years, giving little or no inconvenience until retention of urine is provoked by imprudence, or some irregularity on the part of the patient. A man, seventy years old, who had a stricture dating back forty years, entered Bellevue Hospital, suffering from retention of urine of twenty-four hours' duration. Sundry indiscretions had previously caused retention, but at other times his ailment had given him no trouble.* Occasionally, however, there are cases which pass through all their stages in a few months from the irruption of a urethritis.†

Stricture of the urethra does not get well spontaneously ; it is generally progressive, tending almost always to further contraction when unchecked by treatment, until its orifice is capable of admitting but the smallest probe, or even a bristle.

* See Case viii., chapter iv.

† See cases x. and xiv., chapter v.

SYMPTOMS.

Chronic urethral discharge, or gleet, is almost uniformly the earliest symptom of stricture. At first it is characterized by the escape of a few drops of pus, which keep the external urethral orifice almost constantly moist. In the morning the lips of the meatus are often found glued, and this is discovered by the patient as soon as he attempts to micturate. In time the discharge decreases—unless aggravated by excesses—and seemingly disappears; but if searched for by the medical attendant, it will be detected in the urine, in the form of flecks or of scrolls, which, when examined microscopically, are found to consist mainly of pus. The laity sometimes look upon these appearances as caused by semen in the urine.

Case.—A gentleman who came to consult me, some years ago, about supposed spermatorrhœa, brought with him a vial of his morning's urine, containing numerous short, thread-like, whitish bodies, which he thought were spermatozoa. I placed a drop of the urine upon a glass slide and asked him to look at it through the microscope; he soon felt satisfied that there was no semen in the fluid, and appreciated the real nature of the scrolls when I explained to him that they were layers of pus formed behind a stricture and rolled up by being swept along the urethral walls in the current of urine. Exploration with a bougie-à-boule showed the presence of three strictures, the deepest of which would not admit No. 3.

There is some gleety discharge during all the stages of stricture, which often persists long after the urethra is thoroughly dilated.

Frequent Micturition.—Another early symptom is increased frequency of micturition, with some smarting pain—both due to the irritated or inflamed urethra. After a while the patient is disturbed perhaps two or three times at night. The stream then decreases in size and force, becomes flattened, forked, spiral, or multiple. These symptoms are all intensified as the disease ad-

vances, until there is marked difficulty in micturition; the act is prolonged, accompanied by much burning, "scalding" pain; the urine is passed more and more frequently, in a thread-like stream, or only in a succession of drops, and with the most violent straining; * and finally it dribbles away involuntarily from overflow, the bladder being greatly distended. This has been erroneously looked upon as incontinence. The so-called incontinence has often led to the fatal mistake of supposing that "the patient is safe so long as the water is flowing," whereas the fluid is accumulating in its reservoir more rapidly than it can escape therefrom. This is, in truth, retention of urine, which, though not complete, may soon become so. When urine has been flowing in this manner for twenty-four hours, if a catheter be passed, two or three pints of water will be drawn off.

Complete retention of urine often occurs without any previous dribbling. It frequently comes on suddenly from swelling and spasm, after exposure to cold or over-indulgence in wine or venery, and is not so common a symptom of advanced stricture as incomplete retention; it is sometimes the first warning to the patient that there is obstructive disease of his urethra.

Alterations in the Urinary Secretion.—Usually there is no change in the amount of urine secreted, in persons who suffer from frequent micturition consequent upon stricture. Patients who are not better informed, abstain from liquids in the hope that the quantity of urine will be diminished, and that they will suffer less inconvenience; but in this they are generally disappointed, for even if the urine be decreased, it will contain more saline matter and cause much smarting; whereas those who make free use of diluent drinks are comparatively exempt from scalding, as the urine loses its irritating properties without being materially increased in quantity. It is only in the advanced

* This violent straining often causes hemorrhoids, and sometimes hernia.

stages of the disease, with renal trouble, that the urine is notably diminished.

The quality of the urine is altered in cases of long-standing stricture, when a certain proportion is constantly retained from want of expulsive power on the part of the bladder. This residual urine soon decomposes, and becomes stale, ammoniacal, irritating, giving rise to cystitis; finally the whole secretion partakes of this unhealthy character, becoming vitiated almost as fast as it enters the bladder from the ureters. If collected in a glass vessel, soon after it is passed, an abundant precipitate of the ammoniaco-magnesian phosphates, the phosphate of lime, vesical epithelium, and pus, with more or less "ropy mucus," is thrown down. In advanced cystitis the urine becomes viscid, assuming a dark red and sometimes chocolate color from admixture of blood, and if kept a few hours, becomes intolerably fœtid. This so-called ropy mucus is not really mucus but pus, as it were gelatinized by the ammoniacal urine. This change cannot be better illustrated than by dropping some pus into a test-tube half filled with water, and adding thereto a few drops of *liquor ammoniæ*. After shaking the mixture, the pus will be found converted into a substance identical in appearance and microscopical constituents with the so-called ropy mucus.

SEQUELÆ.

The pathological lesions which occur in consequence of neglected stricture of the urethra, are: 1st, changes in the canal itself; 2d, in the prostate; 3d, in the bladder; 4th, in the ureters; and 5th, in the kidneys. Most of these morbid conditions are of a very serious nature; and their recognition has a great influence upon the mode of treatment and the prognosis.

1. *Expansion of the Urethra in the Vicinity of Strictures.*—The mucous membrane in front of the stricture is occasionally

much inflamed, and often sensitive to an inordinate degree, especially when the patient has made attempts to sound himself. Sometimes, but very rarely, the urethra is expanded in front of the obstruction. The more constant lesion of the canal, however, in long-standing narrow strictures, is expansion of the urethra with attenuation of its walls, and also dilatation of the mouths of mucous follicles and other ducts, *behind* the stricture. This is due to the pressure exerted by the dammed-up urine, which is escaping, perhaps only in drops, through an exceedingly narrow outlet, while an irritated or distended bladder is constantly doing its utmost to rid itself of its contents. The expansion varies from a slightly appreciable increase of capacity, to an ampulla which is capable of containing one ounce or more of urine, and can never completely empty itself.

Urethral Abscesses and Fistulæ.—The mucous membrane of the distended urethra is generally in a state of chronic inflammation. Sometimes ulceration takes place in patches, and favors the escape of a few drops of urine into the adjoining tissues, and an abscess is formed, which slowly makes its way towards the surface, appearing in the scrotum or perinæum as a hard circumscribed mass. Sooner or later the abscess opens externally, discharging at first pus, but afterwards urine, and a fistula is the consequence. In many cases there are several fistulous orifices, some of which are not unfrequently distant from the genitals; yet these fistulæ almost always branch off from a common opening in the ampulla, and often run as one canal for some distance. I have seen one case, in a patient with narrow traumatic stricture, where there was a fistulous opening in the middle of the right thigh, through which nearly all the urine was voided. Another patient had twenty fistulæ in the scrotum, perinæum, upper part of the thighs, and hypogastric region. An abscess may form originally outside of the urethra (from extension of the inflam-

mation, and without antecedent ulceration of the urethral walls), may open first externally, and subsequently establish a communication with the ampulla and give issue to urine. During the formative period of the abscess the patient is occasionally seized with rigors, which he may wrongly attribute to malarial influence.

Rupture of the Urethra and Extravasation of Urine.—The constricted portion of the canal is sometimes plugged by a flake of pus, by a small calculus, or may be so decreased in size by inflammatory swelling and spasm, after a sudden chilling or a debauch, that retention of urine ensues; and during the uncontrollable violent efforts which the patient makes, the thinned urethra behind the stricture bursts, and the urine is extravasated into the connective tissue of the perinæum, scrotum, penis, and the hypogastric and even the lumbar regions. The tissues acted upon by the urine become gangrenous, and unless relief comes promptly the consequences will be disastrous.

Rupture of the Bladder.—Rupture of the bladder, instead of the urethra, may take place when this organ has long been over-distended. This rare accident will be referred to more at length hereafter (see chapter x).

Impairment of the Generative Functions.—The generative functions are sometimes greatly impaired in consequence of long-continued narrow stricture; there may be premature ejaculations of semen in the act of coition, partial loss of the sexual appetite, or even complete impotency from closure of the ejaculatory ducts, and consequent atrophy of the testicles. Then, too, the inflammation of the distended urethra behind the stricture often extends, through the ejaculatory ducts, to the seminal vesicles and to one or both testicles.

2. *Prostatitis and Abscess of the Prostate.*—The prostate is sometimes affected with acute or with chronic inflammation, leading to suppuration and abscess, especially in cases of long-

standing stricture, where violent catheterism has been resorted to. These abscesses may open into the urethral canal, or find their way to the perinæum or the rectum. They rarely prove fatal, though occasionally death ensues through the intervention of pyæmia. Atrophy of the prostate also may result from long-neglected stricture with retention of urine.

3. *Acute and Chronic Cystitis*.—The changes which the bladder undergoes in neglected stricture of the urethra are consequent upon the retention of urine. Extreme over-distension will cause acute or chronic cystitis, and also atony, and even attenuation of the walls of the viscus. Acute cystitis usually subsides as soon as the cause is removed; but not so the chronic inflammation, which is often of the most intractable character. I have known it to last for years after all urethral obstruction had been removed.

Concentric Hypertrophy of the Bladder.—Incomplete retention of urine, occurring frequently, will in time cause concentric hypertrophy of the bladder with diminished capacity, wherein the interior of the organ presents the appearance of the right ventricle of a hypertrophied heart, with large fasciculi of muscular fibres crossing each other in every direction. The muscular layer is often an inch in thickness, and sometimes contains small abscesses. In these cases the mucous membrane is intensely congested, and occasionally ulcerated in patches.

4. *Pyelitis, Nephritis, Hydronephrosis, Pyonephrosis*.—The inflammatory action may be traced to the ureters (ureteritis), the renal pelves (pyelitis), and to the kidneys themselves (nephritis); and all this is the result of the pent-up urine, for the ureters and pelves are often found greatly distended with urine (hydronephrosis), or with pus (pyonephrosis).

5. The distension of the ureters is not uniform, but there are generally three, four, or five constrictions in the course

of the tubes, similar to strictures in the urethra. The constant damming-up of the urine finally exerts a pernicious effect upon the kidneys. The first lesion is congestion, then inflammation, and finally disorganization from the fluid pressure.

Constitutional Disturbances.—In addition to the lesions above named, stricture gives rise to certain constitutional disturbances. The brain and entire nervous system are sometimes in a state of irritation, leading to a train of phenomena which have been properly denoted *urinary neuroses*. These nervous symptoms manifest themselves as well in the early as in the advanced stages of stricture. There may be general *malaise*, constant headache, sleeplessness, great despondency, often suicidal ideas, and all this too before the sick man suspects the existence of any urethral lesion other than a slight gleet discharge.

Neuralgia.—Frequently there are also neuralgic pains in the lumbar and hypogastric regions, in the course of the ileo-scrotal, obturator, anterior crural, and sciatic nerves. After walking, patients complain of pain in the heels and soles of the feet, especially on the left side. There is, in some cases, a periodicity in the occurrence of these symptoms, which leads the unwary to attribute them to malaria. The attention of the profession was especially called to these latter manifestations, as symptomatic of stricture, in 1809, by Mr. Luxmoor, of London. They are, however, common to diseases of the bladder, prostate, and rectum, and are of very frequent occurrence in the other sex, from uterine displacements and diseases.

Reflex Paraplegia.—Another nervous phenomenon called reflex paraplegia sometimes occurs in connection with stricture, particularly in young subjects, with congenital stricture at the *meatus urinarius* and phimosis. The latter affection, with its irritating collections of smegma, is of itself sufficient to produce these reflex symptoms. In the majority of cases the patient's health may

be restored by means of circumcision and the free division of the stricture.* These various ailments are soon succeeded by impairment of the digestive and other functions, and finally the patient seeks medical aid, not for his real trouble, but on account of what he suffers in consequence. It is a common thing for persons to consult their medical attendants for troublesome and long-standing sciatica, often confined to the left side, with the story that they have been cupped and blistered repeatedly, and have made use of hypodermic injections of morphia, etc., etc., with no lasting relief. Close examination of such cases rarely fails to bring to light some disorder of the urinary organs, the cure or relief of which speedily removes all the existing nervous complications.

* My colleague, Dr. Sayre, has recently published an article on Reflex Paraplegia from Phimosis, in which he details several cases completely cured after circumcision.

CHAPTER II.

DIAGNOSIS OF STRICTURE.—CATHETERISM.—ACCIDENTS OF CATHETERISM.—URETHRAL FEVER.

THOUGH the consideration of the rational signs of stricture of the urethra is of great importance, it is not proper to rely upon them entirely. To make the diagnosis complete, direct exploration, which is the only certain mode of demonstrating the presence of a constriction of the canal, must be resorted to.

After the discovery of the true nature of strictures, it became evident that a more or less exact appreciation of their locality would be necessary to permit the application of the requisite treatment. Ordinary sounds and wax bougies were at first used, but unless the stricture happened to be tolerably dense and narrow, it yielded to the firm instrument without any perceptible sign. A sound or catheter of small size would often lead to the opposite error—its liability to impingement in the neighborhood of the triangular ligament, inducing the operator to believe that there was a constriction where none really existed. Ducamp devised an exploring sound with prepared wax at the extremity, to take impressions of strictures, somewhat after Arnott's plan. Civiale used wax bougies for the same purpose; and to obtain a like result Prof. Bigelow, of Boston, resorted to gutta-percha bougies. These various methods, possessing neither delicacy nor precision, have been renounced, together with numerous others, as totally inefficient and sometimes dangerous.

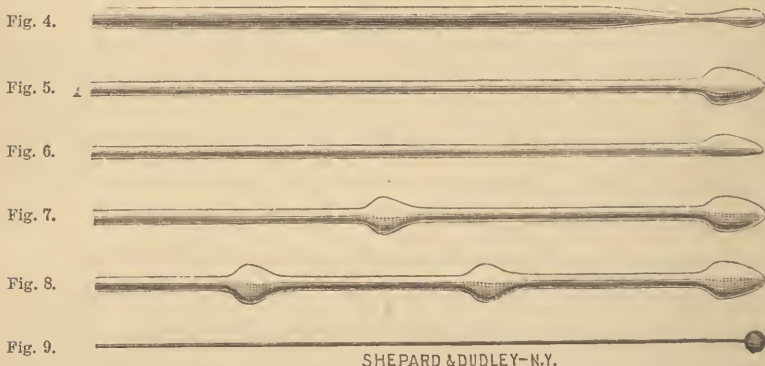
Bougie-à-Boule.—The simplest, safest, and best of all the explorers now in use is, I think, Leroy d'Etiolles' gum *bougie-*

à-boule. This instrument, commonly called the bulbous bougie, has an olivary point, but must not be confounded with the olive-pointed bougie figured below (Fig. 4), which is used for an entirely different purpose, and is ill adapted to exploration. In the olive-pointed bougie, the olive is connected to the shaft by its point, while in Leroy's bougie it is attached by its base. The former instrument tapers in its last inch or two from a calibre greater than its olivary point, to the comparatively small shaft to which the olive is affixed,—rendering it quite useless for the diagnosis of a second stricture after one has been passed,—while the latter has a shaft of uniform size, six or eight numbers less than the calibre of its olive (Fig. 5). The *bougie-à-boule* is a modification of Sir Charles Bell's "ball-probes or urethra-sounds," which consist of metallic probes or wires with spherical extremities "varying from the full size of the urethra to what will just pass the narrowest stricture" (Fig. 9), and which their inventor used as explorers in urethral strictures.* Mr. Leroy, finding that the ball-probes caused too much pain by reason of their stiffness, substituted soft material for the metal, and olivary extremities for the spheres.† Bougies constructed on this plan possess a degree of flexibility which permits them to accommodate themselves to the curves of the urethra, and to yield to the slightest obstruction; qualities by which they are rendered infinitely more delicate than metallic instruments, and superior thereto in every other respect. These bougies vary in size from number one to the largest numbers in the scale. The vesical extremity of most of them is olivary, but some have only a half olive (Fig. 6) for the appreciation of eccentric and of bridiform strictures; others

* See System of Operative Surgery, etc. By Chas. Bell. Vol. i. p. 104. Lond., 1807.

† Des Angusties ou retrécissements de l'urètre et de leur traitement rationnel. Par le Dr. Leroy-d'Etiolles, etc., etc. Paris, 1845, p. 122.

have a second olive (Fig. 7) one and a half or two inches from the first, while others again have three expansions (Fig. 8), and are called by Phillips "bougies-à-nœuds" (knotted bougies).



The shaft is solid in some of the instruments, but in the majority it is hollow, to receive a smaller bougie or a metallic rod, when greater stiffness is required; sometimes a fine leaden stylet, a soft copper wire, or a slender shaft of whalebone is inserted for that purpose; only smaller instruments require this reinforcement.

Before commencing the direct exploration of the urethra it is desirable to see the patient urinate, to ascertain the character and size of his stream, which, however, is almost always of greater calibre than the stricture. The glans penis should then be particularly examined, and the position and size of the meatus ascertained; and the finger should be carefully passed along the corpus spongiosum to detect any induration surrounding or underlying the urethra. When these preliminary operations are concluded, the bougies—for all purposes prolongations of the fingers—may be employed, and subsequently the urethroscope may bring sight to aid touch. The microscopic examination of the urine should not be neglected, as it is of great assistance in determining the condition of the urinary organs.

Mode of Using the Bulbous Bougie.—The gum bulbous bougies are used for diagnosing strictures in the following manner: the penis is grasped by the left middle and ring fingers, while the thumb and index serve to retract the prepuce and



FIG. 10.



FIG. 11.

separate the lips of the meatus; then an instrument, as large as the orifice will easily admit, having been oiled, is slowly and gently introduced into the canal till it meets an obstacle which presents a positive hinderance to its further progress (Fig. 10); the stem of the bougie should be marked by the thumb-nail exactly at the meatus,

and withdrawn and measured to ascertain the location of the stricture. The length of the stricture can be determined by using an instrument sufficiently small to pass through and beyond the obstacle (Fig. 11). This bougie should then be pushed onward, in search of other impediments, until it has reached the bladder, where it may be retained a moment, and then slowly withdrawn till the base of the olive presents at the vesical extremity of the constriction. If the measuring above directed be now repeated, and the first measurement, *plus* the length of the smaller bulb, be deducted from the second measurement, there will remain the length of the stricture. Besides pointing out the locality and length of strictures, these bougies aid us in ascertaining their form, diameter, and number, with sufficient accuracy for practical purposes. Bulbous bougies are of no account as dilators, and should not be employed as such; they are intended mainly for exploration from behind forward, their fitness for which is the one great advantage they possess over plain instruments. They are very useful in the diagnosis of stricture in its formative stage, as tender spots in the urethra and granular urethritis are, with

their aid, readily discerned. A bougie that accurately fits the canal, will indicate the locality of a tender spot as its bulb passes over it, and on its withdrawal, if there be any granular urethritis the base of the olive will be found loaded with pus. I have frequently resorted to this expedient to satisfy myself of the existence of localized chronic urethritis, or of commencing stricture, in cases where there was no perceptible discharge of pus, and where no urine had been obtained for microscopic examination.

The Endoscope.—To arrive at the same result, ocular inspection is employed by the aid of the endoscope, an instrument used

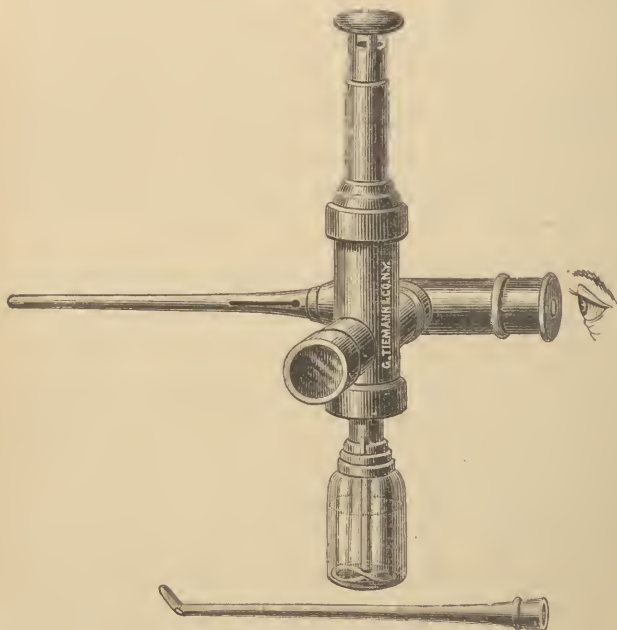


FIG. 12.—Désormeaux's Endoscope.

in our country early in the present century (1824), and invented by Dr. John D. Fisher, of Boston,* but greatly improved, within

* See an article on "Instruments for Illuminating Dark Cavities," *Philadelphia Journal of the Medical and Physical Sciences*, 1827, vol. xiv. p. 409.

a few years, by Messrs. Désormeaux, Cruise, and others. Désormeaux's endoscope consists of a series of metallic tubes, equal in calibre to Nos. 10, 12, and 14, about nine inches in length, and open at both extremities, and of an illuminating apparatus (Fig. 12). This instrument has been modified by Dr. Cruise, of Dublin, and a further improvement has been made by Messrs. Warwick and M. B. Hill, by the substitution of sunlight or of a gas-jet for the lamp; these contrivances render the instrument lighter and of easier manipulation; still, it is too complicated, cumbrous, and expensive ever to be generally used, and may well be replaced by the more simple and primitive urethroscopes. One of the best of these was devised by Dr. Otis (Fig. 13), and is manufactured by Messrs. George Tiemann & Co., Surgical Cutlers. This instrument, made of hard rubber, is very light, easily handled, and causes little if any pain when in position; light reflected by means of a concave mirror from the sun, or from "Tiemann's modified student's lamp," being used for illumination.*

Catheters and Sounds.—The treatment of stricture, as well as its exact diagnosis, is, in the great majority of cases, carried on by the aid of instruments introduced into the urethra. All instruments of this exploring nature were, by the ancients, denominated catheters; and the name is retained by the



(Fig. 13.) Dr. Otis's Urethral Speculum.

* For the details of the mechanism and uses of the endoscope, see Désormeaux' "De l'Endoscope et de ses applications au diagnostic et au traitement des affections de l'urèthre et de la vessie." Paris, 1865. Also a paper by Dr. Francis Richard Cruise, "On the Endoscope as an Aid in the Diagnosis and Treatment of Disease," Dublin *Quarterly Journal of Medical Science*, 1865, vol. xxxix. p. 329 *et seq.*

moderns, though with more restricted significations. In the United States and in Great Britain the term is confined to the hollow, evacuating instrument, while in France it is applied to the solid instrument which we call the sound. The French word bougie, meaning literally a wax candle, has been adopted by us to cover all the varieties of flexible instruments, and has sometimes even a wider signification.

The catheters used by the ancients, in the urethra, were for the most part hollow, and were employed in the relief of retention of urine. They were made of copper, brass, lead, and finally silver, and were generally curved near their vesical extremity; the main difference between them and the modern catheters being in the degree of curvature. Metallic catheters were then almost exclusively used, though it may be worth while, as a matter of curiosity, to note that catheters were occasionally made of such strange substances as horn, and ivory softened by acids, and that even chamois and dog-skin catheters, protected within and without from moisture by varnish, have been used.

The metals have always retained the highest place among the proper materials from which to make urethral instruments. Tin sounds were and are still much used in France, and were many years ago introduced into this country. On account of its cheapness, this metal will probably continue to be used for years to come, although it is in every respect inferior to steel. Steel possesses the advantage over tin, of being susceptible of a much higher polish—a great desideratum, considering the delicacy of the mucous membrane with which it is designed to come in contact. It may be protected against rust by a plating of gold, silver, or nickel.

Metallic sounds, especially the steel, are rejected by some French and English surgeons, who advise the use of gum instruments in preference. This may be good advice, not because gum

instruments give less pain,—they do not,—but on account of the easy introduction of the modern flexible gum bougies with olivary extremities (Fig. 4). Their great advantage is, that anybody can introduce them; there is ordinarily no great skill needed, and no danger to be apprehended of lacerating the mucous membrane. They are the safest instruments in the hands of beginners. In my own practice I use the gum bougies almost exclusively up to No. 7—I have no ordinary steel sounds smaller than 7—but having reached that number, I usually set aside the elastic instruments to use the smoothly polished conical steel sounds. Patients, in taking note of the change, almost always speak of the slight pain they feel during the passage of the metallic, as compared with that produced by the gum instrument.

Curve of Sounds.—All manner of curves, great and small, have been given to the metallic instruments; but that of Franco, and also of Paré, corresponded more closely, than others of the period, to the curve of the urethra. In the last century the great master, J. L. Petit, enforced the excellent precept in catheterism, that to sound with facility and little pain, the curve of the instrument should be as near as possible equal to the curve of the urethra.* But it is no easy matter to determine the precise curve of the urethra,—only an approximate idea can be formed of it,—as in no two subjects is it exactly the same. Mr. Briggs and Sir Henry Thompson, who have made numerous measurements on the cadaver, have found it to average three-tenths the circumference of a circle three and a quarter inches in diameter, the axis of the circle corresponding to the centre of the pubic symphysis. The latter surgeon has adapted the curve of his sounds to this average.†

* Petit. Œuvres Posthumes. Vol. iii. p. 61, 3ème Edit. Paris, 1774.

† To Professor Van Buren is due the credit of having popularized, in New York, the excellent sounds curved after Thompson's model.

Baron Heurteloup had previously arrived at nearly the same result, and had constructed a sound of a curve equal to one-fourth the circumference of a circle eight centimetres ($3\frac{3}{16}$ inches, or thereabouts) in diameter. Either curve will answer well in the majority of cases, but the one we use habitually is Thompson's.

Conical Sounds.—Besides a correction of the curve, there is another means of facilitating catheterism, and of rendering it less painful, and that is by having the instruments—catheters and sounds—made moderately conical at their vesical end, that they may act upon the urethral canal as cylindrical wedges.* (Fig. 14.)

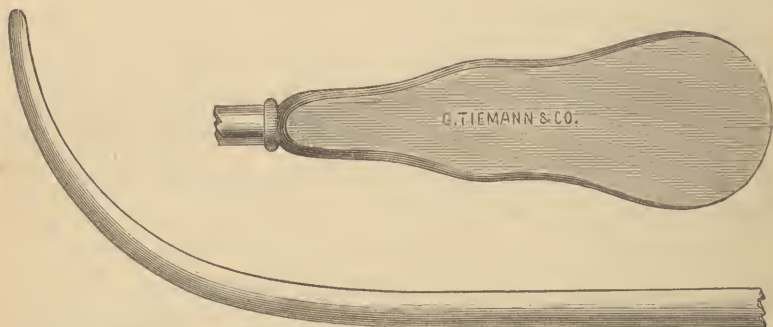


FIG. 14.—Conical sound with curve equal to three-tenths the circumference of a circle three and a quarter inches in diameter.

Ever since the year 1864 I have been using such sounds, made of smoothly-polished steel. The point in each is three or four numbers (rarely more) smaller than the shaft, and the conicity

* The principle is an old one, and though recommended more recently by Mr. Liston and other masters, it does not seem to have been much applied, neither do I know of any methodical or definite conicity being adopted for steel sounds before 1864, when I had mine made at Tiemann's. Boyer's sound terminated almost in a point, and the conical sound figured in Sir Henry Thompson's book on stricture seems to be conical all the way up to the handle. Some sounds which I saw many years ago at Bellevue Hospital tapered from the point to the handle, a difference in size of seven or eight numbers. In using such instruments, it is impossible to ascertain the exact degree of dilatation obtained, and, besides, the posterior extremity of the stricture, if a long one, is less dilated than the anterior.

occupies about one inch and a half (Fig. 14). The length of the instrument from the point to the junction of the shaft and

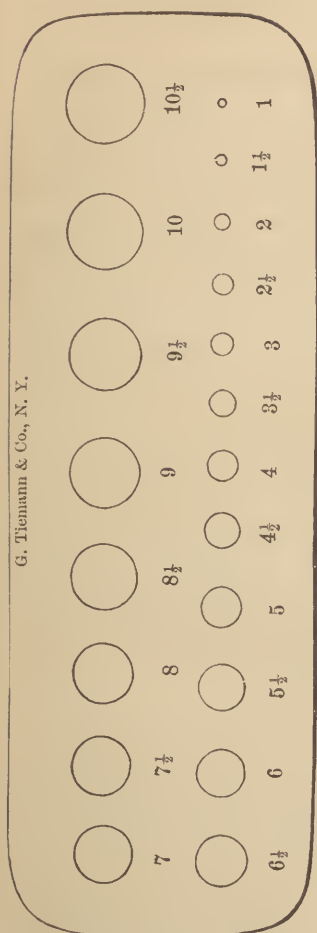


FIG. 15.

The author's metrical sound-gauge.

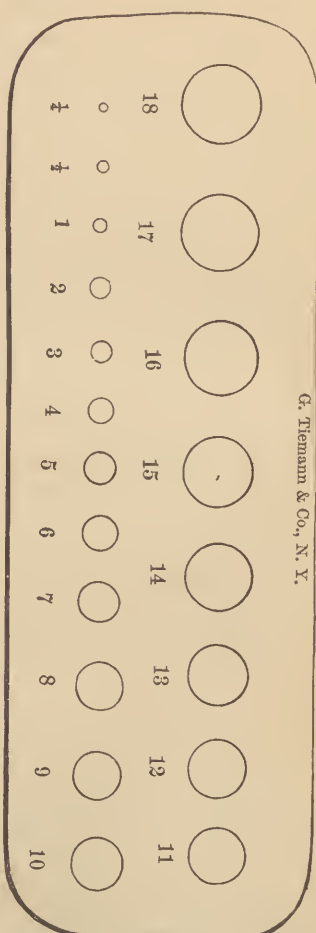


FIG. 16.

handle is nine inches. The handle, like the shaft, is smooth, and its edges have no angular projections, but all curved lines. The smallest instrument constructed on this plan is five millimetres in

diameter at the shaft, a little less than No. 7 of the English scale; the largest is ten and a half millimetres, about No. 18. In rare instances they are made as large as eleven and eleven and a half millimetres (Nos. 19 and 20).

Metrical Sound Gauges.—As the numbering of sounds according to the English gauge—which is the scale generally employed in this country—gives no definite idea of diameter, it occurred to me, in 1866, to combine this scale with a modification of the French, or in other words to have the sizes of the gauge in millimetres marked over against the numbers. To do this it was necessary to change the sizes of the old numbers but slightly and immaterially.* The new gauge consists of twenty numbers, the smallest, one millimetre, and the largest ten and a half millimetres in diameter, with a difference between each two numbers of half a millimetre instead of one-third, as in the French scale. On one side of my gauge (Fig. 15) is stamped the diameter of each aperture in millimetres, and on the reverse side numbers from No. $\frac{1}{4}$ to No. 18 (Fig. 16), which very nearly correspond to the numbers of the English scale. Upon the handle of each sound both the number and diameter are stamped.

CATHETERISM.

In treating urethral troubles, very much of the surgeon's success depends upon the manner in which he handles instruments. It is perhaps almost needless to say that the same gentleness, deliberation, and coolness exercised by every well-bred surgeon in exploring other parts of the body, should be bestowed upon all manipulations about the urinary organs. There is no department of surgery—not even excepting ophthalmology—where good judgment, and an exceedingly light and steady hand, are more required than in the diagnosis and treatment of disorders of the urethra

* The English have lately adopted the French metrical gauge.

and bladder. To impress as strongly as possible the importance of delicate catheterism, I shall borrow a paragraph from our eminent countryman, Professor S. D. Gross, who has a better right than I to speak *ex-cathedrá*, and who says: "The introduction of the catheter, although apparently very simple, is one of the nicest and most delicate processes in surgery. It requires skill of the highest order, as well as the most intimate knowledge of the anatomy of the urinary organs. If I were called upon to state what I considered as the most important operation that a practitioner is obliged to perform, I should unhesitatingly say the introduction of the catheter. It is true, the most untutored and awkward surgeon may occasionally, nay, perhaps not unfrequently, reach the bladder without difficulty; but let such an individual attempt the passage of the instrument when there is some mechanical obstacle, as a stricture or an enlarged prostate, and he will be sure to be foiled. The moment the catheter is arrested, he becomes bewildered; his hand trembles, dismay is depicted in every feature, large drops of sweat stand upon his brow, and his whole frame is paralyzed. If, under these circumstances, he proceed, he will inflict severe suffering upon his patient, if not actually endanger his life. To avoid such an occurrence, as disgraceful as it is unfortunate, the operation should be constantly practised upon the dead subject; the anatomy of the urinary apparatus should be thoroughly studied; and *the eye, hand, and instrument should be trained to move in concert with each other.*"

Position of Patient during Catheterism.—It is a very unsafe practice to attempt to introduce the catheter or the sound while the patient is in upright position, for the first time at least, as he is liable to become sick and faint, and may even fall senseless, and, after recovering, be in such a state of exhaustion that it may be deemed inexpedient to pursue the operation. To prevent such

an accident, the patient should be placed supine upon a firm bed or a couch.

Mode of introducing the Metallic Instruments.—The operator, standing or sitting on the left side, should seize the body of the penis laterally with the left middle and ring fingers—palm up—and give the organ a vertical direction; then with the right hand he should hold a warmed and oiled sound, or a catheter, loosely by the handle, with the thumb, index, and middle fingers, and gently drop the point into the urethral orifice, held open by the left thumb and index. The shaft of the instrument should lie close to the body in the line of Poupart's ligament. The penis and sound should next be simultaneously moved; the former in the direction of the latter, while the latter should be slowly carried onward to the depth of about five inches. The instrument should then be brought to the median line of the body and made to assume a perpendicular direction, guided by a single finger, until the point has reached the pubic arch by its own weight; lastly, the handle is depressed between the thighs, when the point will enter the bladder.

This sort of catheterism is intended mainly for dilatation of the urethra.

Metallic catheters are now seldom employed to draw off urine, for with the improved gum catheters this is done more safely, speedily, and conveniently. In cases of very narrow strictures, however, where it is necessary to relieve retention of urine, the slender tunnelled metallic catheters with conductors are often used with great advantage over all others. But this matter will be dilated upon when the subject of difficult catheterism is discussed, under the head of treatment of narrow strictures, and of retention of urine.

Force should never be used in catheterism, for it not only defeats the object in view, but inflicts much damage upon the

urethral walls, and gives rise to other serious if not fatal complications.

ACCIDENTS OF CATHETERISM OF THE URETHRA.

When an instrument is introduced into the urethra to explore the bladder, draw off urine, or dilate a stricture, local and constitutional accidents, more or less grave, sometimes supervene, and these are most frequently the result of violence; but occasionally, even cautious, gentle, and successful catheterism is followed by alarming symptoms, and even by death.

Among the local Accidents are false passages, hæmorrhage, dysury, strangury, ischury, cystitis, prostatitis, urethritis, and orchitis.

False passages, or false routes, are accidental canals made between the walls of the urethra, usually by small metallic instruments, in attempts to enter forcibly narrow strictures, or in incautious catheterism for the relief of retention of urine from enlarged prostate; they are frequently submucous, and are for the most part short *culs-de-sac*; occasionally, however, they re-enter the urethra in front or even behind the obstruction. Sometimes the instruments plough their way for some distance into the spongy substance, perforate the urethra, and pass between the prostate and rectum,* or may even enter the cavernous body. I know of an instance where, in attempting the operation of divulsion for the cure of a urethral stricture, the surgeon gave a wrong direction to the instrument (Holt's), which made a false route in front of the stricture, and passed through the coats of the urethra and entered the cavernous body of the penis; this false passage was largely divulsed, and the damage was not suspected at the time, but the autopsy brought it to light.

* See Case 2, chap. iv., of a false passage four inches in length.

I remember well the case of a boy, fifteen years old, who, in 1860, was under the care of a surgeon for retention of urine, caused by laceration of the urethra from a contusion of the perinæum. An ordinary silver catheter was several times introduced with much force its whole length, while it was evident, from the absence of urinary flow, and from rectal exploration with the finger, that the instrument had passed out of the urethra through the rent, and its point could be distinctly felt lying between the bladder and rectum. The little fellow lived, in spite of this very rough interference. A free incision, which was finally made in the centre of the perinæum, gave issue to a quantity of pus and grumous blood. I have witnessed several cases in which there were two, three, and even four false passages.

False routes sometimes give rise to considerable hæmorrhage, and subsequently to abscess around the urethra and prostate, and to urinary fistulæ.

CASE.—In September, 1871, I saw, in consultation with Dr. Janeway, a young gentleman who had been catheterized by an irregular practitioner two weeks before. The operation was very painful, and followed by a smart bleeding and considerable constitutional disturbance. Dr. Janeway was soon after called in by the patient, and discovered a large peri-urethral and peri-prostatic abscess, giving rise to much bulging in the rectum and perinæum. The abscess having been early and freely opened in perinæo, the patient made a rapid recovery without fistula. The catheter had been driven through the lower wall of the urethra, and pushed probably as far as the base of the prostate; but owing to the valvular character of the urethral rent, there had been no infiltration of urine. Even after the abscess was opened not a drop of urine passed by the perineal wound, though at first a sound introduced per urethram made its way into the cavity of the abscess, and was there felt and seen by me.

I had previously seen two similar cases, but there ensued, in each, urethro-recto-perineal fistulæ. In one case the rectal and then the perineal fistula closed, owing to the persistent use of

large sounds, but the other patient, a phthisical subject, did not get well of his fistulæ, though treated for about two years.

The other local accidents mentioned above are treated of in other parts of this book.

The Constitutional Manifestations are: 1st. Rigors with febrile reaction, sometimes followed by suppression of urine, and spoken of under the generic term of urethral or urinary fever.* 2d. Pyæmia.

1. URETHRAL FEVER.

It is a well-established fact that urinary or urethral fever arising from violence to the urethra or bladder is "due to shock propagated by the sympathetic nervous system and reacting upon the blood vascular system," and that there is some analogy between this ailment and malarial fever; hence the additional title of *intermittent* urethral fever. Urinary fever may be ushered in by a very slight rigor, or even only by a sense of formication or of horripilation, followed by little if any febrile reaction; or the attack may be of the most violent, overwhelming, fulminating character, similar to congestive remittent fever of the severest type, and may cause death in an extremely short space of time. Mr. Banks relates the case of a man between forty and fifty years of age, apparently much broken down in health, who was treated at the Liverpool Royal Infirmary for urethral stricture. There was a false passage in the urethra, and the first catheterism failed, but the second was successful (No. 6 or 7 catheter), and, though difficult, "no undue violence was used, and very little pain was com-

* Urinary fever occurs very frequently in cases of urethral, prostatic, and vesical trouble, where no instruments have ever been passed, and is then an indication of the existence at least of renal congestion. But in these instances it is—with the exception of cases of far-advanced disease—of a milder type than when it occurs from instrumentation, and is often mistaken for malarial fever. The removal of the cause of vesical trouble or of urethral obstruction soon cures this form of "ague."

plained of ; there was no bleeding, and nothing to indicate that there was any lesion of the urethra, except the pre-existing false passage, but almost immediately after the entrance of the catheter into the bladder the man was seized with a severe rigor. The instrument was at once cautiously withdrawn, but the patient passed into a state of profound syncope, and in a few minutes died." No autopsy could be obtained, but the existence of a flabby heart was strongly suspected.* Mr. Banks also gives the account of a typical case of urethral fever, from catheterism, proving fatal in six and a half hours after the passage of the instrument. In this case the stricture, which was long and narrow, and in the pendulous portion of the urethra, had been gradually dilated to No. 4. On the first day a small probe only could be passed, and was left in for half an hour. On the third or fourth day, Nos. 1 and 2 metallic bougies were tried, but failed, and a fine probe-pointed bougie was passed and retained ten minutes, and two minims of Fleming's tincture of aconite given. The dose of aconite was administered after each catheterism, which was practised every four days. On the next occasion Nos. $\frac{1}{2}$ and 1 were passed through the stricture, and after these a fine catgut bougie, which was left in for an hour. When removed it was found still tightly grasped, and on this and each succeeding occasion a stream of urine followed the withdrawal of the instrument. In this way the urethra was dilated, chiefly by catgut bougies, till the fatal day, when No. 4 metallic bougie was passed through the stricture into the bladder for the first time. It entered quite easily, was removed in about ten minutes, and was followed

* "On certain rapidly Fatal Cases of Urethral Fever after Catheterism." By W. Mitchell Banks, F.R.C.S.E., Lecturer on Anatomy in the Liverpool School of Medicine. *Edinburgh Medical Journal*, June, 1871, p. 1074. The reader is referred to Mr. Banks' excellent article for some very important and interesting particulars regarding this subject.

as usual by a stream of urine, but no blood. The usual dose of aconite was given. In about half an hour he vomited his dinner, and soon had a rigor. In two hours he had another rigor, still continued to retch, and had a rapid pulse. Another two-minim dose of Fleming's tincture, with brandy and water; but this was soon vomited, and nothing could afterwards be tolerated. He then began to complain of pain in the region of the bladder and loins, the pulse became quicker and weaker, and in spite of all that could be done the retching continued, and he died, having lost consciousness but a moment before, in six and a half hours after the last catheterism. The autopsy revealed a long stricture, commencing at about two inches from the meatus. No injury whatever had been done to the urethra. The organs were all perfectly healthy. No congestion of the lungs. In the bladder was about a tablespoonful of thick muddy urine. The kidneys were examined with great care; they were slightly congested, and on pressure a thick turbid urine escaped from the calices, but beyond this no disease was found.

Similar cases were mentioned by Reybard, Velpeau, and others, but in most instances death has not been so sudden as in the foregoing cases of Mr. Banks; twelve to twenty-four hours, or even more, elapsing between the catheterism and the fatal issue. In cases of urinary obstruction with renal complication, unless the precautions to be hereafter indicated be taken, urethral fever is almost certain, at one time or another, to follow the introduction of the catheter. The instrument may have been passed at regular intervals for weeks or months without any very great amount of pain, and without giving rise to any discomfort; or it may have been followed on one or two occasions by a mild attack of fever; but finally the same careful catheterism is practised—but *on the wrong day*, perhaps, when the patient's functions are temporarily disordered—and in a few hours he is suddenly and unexpectedly

seized with a severe rigor, from the effects of which he may never rally. Sir Henry Thompson reports a case in point at page 94 of his *Treatise on Stricture of the Urethra*, third edition, London. He says: "I have seen one case of old-standing and narrow stricture, in which death was thus caused within fifty-four hours of the passing of an instrument, the same that had been habitually employed on at least a hundred occasions before; no damage whatever having been inflicted by it upon the urethra, as verified by several careful observers on close post-mortem examination of the parts. Rigors and vomiting commenced about an hour after the catheterism, and not another ounce of urine was secreted from that time until death. The kidneys were congested to an extraordinary degree, and their substance was so soft and friable as to give way under gentle pressure. Very rapid changes had evidently taken place in these organs, but no signs whatever of inflammation existed in any other part of the urinary apparatus."

The grave type of urinary fever is a much dreaded, but now comparatively rare, accident of the operations of lithotripsy, lithotomy, internal and external urethrotomy and divulsion; as these operations are not resorted to, in our day, when advanced disease of the kidneys and of the bladder is suspected. In thirty-one operations of external perineal urethrotomy, there occurred but three cases of urethral fever, the attacks being mild in two, but fulminating in one which ended fatally in fifty-six hours. (See case xi. chap. vii.)

Between these two extreme types—the very mild and the very severe—there is a form of urethral fever, preceded by headache, malaise, pain in the back, and, in fact, all the premonitory symptoms of an attack of ague, in which the chill may be deferred four, eight, twelve, twenty-four, or even forty-eight hours after catheterism or other operation upon the urinary organs. This is, however, amenable to treatment, and recovery may be expected in the great majority of cases. It has long been supposed

that the chill is ushered in by the passage of urine upon a denuded surface ; but such is not the case, as the rigor often occurs before the first act of micturition, or when—the patient having been repeatedly relieved by the catheter—not a drop of urine has come in contact with the urethral canal. If the contact of the urine with the raw surfaces were the sole, or even the principal cause of this trouble, urinary fever would almost always ensue from lithotomy, internal and external urethrotomy, and divulsion ; but facts are against this theory.

Suppression of urine is a common complication of urethral fever ; but, though frequently fatal, is not always so. Mr. Banks, in speaking of the rapidly fatal forms of urethral fever with suppression of urine, says : “ In many cases no urine is secreted from the moment the instrument has been passed to the time of death, and this non-secretion has too often been reported as the primarily fatal cause, without consideration of the fact that it is simply a secondary effect upon the renal organs of the great general shock, and, although without doubt greatly tending to precipitate the fatal event, should by no means be regarded as a primary cause, but only as a complication. This is shown, 1st, by the fact that persons have been known to die so soon after catheterism that the mere non-secretion of urine could have had nothing to do with the fatal issue. . . . 2d, even when no urine has been secreted, and time has been given for the non-eliminated urea to act noxiously, the symptoms have not been those of uræmic poisoning.”

Among the severe cases that I have observed, several showed symptoms of uræmic poisoning ; some of them recovered, but the majority died. On post-mortem examination, the kidneys were found in a state of congestion in some, of infarction in others, while in others still—that lingered several days—there was interstitial nephritis in its various stages.

Suppression of urine may be partial or complete; the former is of frequent occurrence, while the latter is rare. The symptoms are, dull pains in the regions of the kidneys, no desire to void urine, some febrile reaction, thirst, sometimes vomiting of green bilious matter having a disagreeable urinous smell. The alvine dejections have the same urinous fetor, and the breath and the cutaneous perspiration are also offensively urinous.

2. Pyæmia.—Purulent infection occasionally follows urethral fever, although it usually occurs independently of this ailment; and the irregular chills which are caused by urethral pyæmia should not be confounded with those of urethral fever.

Treatment of Urethral Fever.—As the existence of renal disease is a strong predisposing cause of urethral fever, it is necessary, in case such disease is even suspected, to institute a preparatory course of treatment for several days before the intended catheterism be attempted; but I go further than this, and prepare all patients—with the exception, of course, of urgent cases—for five or six days before they are placed under mechanical treatment, and consequently now have, in my own practice, but very few cases of urethral fever to treat. The preparatory treatment which I usually resort to is as follows:—After free catharsis, rest should be enjoined for a day or two, a hot hip-bath ordered at night, a diluent drink three or four times daily, ten minims of tincture of chloride of iron three times a day, and five grains of quinine every night.

Quinine was first given in free doses for urethral fever by Bricheteau, who, in 1847, reported several cases successfully treated with doses of ten, twelve, and fifteen grains.* More recently, Ricord, who was not at first a believer in the efficacy of quinine in urinary fever, said, at the Surgical Society of Paris,

* Des Fièvres Intermittentes Pernicieuses chez les vieillards. *Archives Générales de Médecine*, 1847.

that he had come to the point of never performing any operation upon the urethra without having previously administered quinine, and that ever since he had adopted this preventive treatment, the number of cases of urethral fever, so great before in his hospital service, had almost miraculously diminished. This alkaloid is undoubtedly one of the most effective of the remedial agents given to combat urethral fever, and should be administered in a dose of at least ten grains, with half a grain of opium after each catheterism, and, when necessary, should be increased to fifteen or twenty grains in the twenty-four hours.

Aconite.—Mr. Long speaks highly of two-minim doses of Fleming's tincture of aconite, for preventing rigors in cases where they had occurred after catheterism.* This is, I believe, another excellent remedy, but not equal to quinine. I have lately, however, given them in combination.

In the very mild cases of urethral fever, a hot drink of any kind, and rest for a few hours, will generally suffice.

When that ominous complication, suppression of urine, occurs, the case should be treated with the greatest caution; and, let me first say, the medical attendant should beware of administering stimulating diuretics. After the first catheterism—to positively exclude retention of urine—no instrument of any kind should be passed into the urethra. The next indication is to establish at once a vicarious excretion of the elements of the urine, if Nature in her conservative effort has not already done so. The skin and intestinal mucous membrane should be made to do duty for the kidneys until the latter are in condition to perform their function.

The hot-air bath is the most rapid mode of effecting diaphoresis; but as it cannot be given more than once or twice in the

* *Liverpool Medico-Chirurgical Journal*, January, 1858.

twenty-four hours, it is necessary to administer by mouth quarter of a grain doses of ipecac every two or three hours, with hot borage tea, or any other diaphoretic.

Catharsis may be procured and kept up by any of the hydragogues; but small doses of sulphate of soda and of magnesia, in hot water, often repeated, will fulfil the object very well, without weakening the patient. Hot fomentations should be constantly applied during the day to the lumbar and hypogastric regions, and the loins should be freely dry cupped. Then a teaspoonful of the infusion of digitalis* should be given every hour or two hours, and the effect on the circulation closely watched.

The whole cutaneous surface, which exhales sometimes such an offensively urinous odor, should be thoroughly dried and rubbed with a warm towel, at least three or four times in a day. The patient should be covered in bed, well nourished with concentrated mixed food; and if he should become enfeebled by too profuse diaphoresis, a hot brandy toddy should be administered once or twice a day.

The patient is generally safe, if there be not advanced renal disease, so long as diaphoresis and catharsis can be kept up. Complete suppression of urine may last several days, but when the kidneys do not secrete urine in the course of three or four days, the chances of recovery are decidedly lessened.

* The infusion should be used in preference to the tincture or the extract of digitalis, as it is known to be more effective as a diuretic than either of the latter.

CHAPTER III.

CONSTITUTIONAL AND SURGICAL TREATMENT OF STRICTURE OF THE URETHRA.—TREATMENT OF STRICTURE IN ITS INCIPIENT STAGE.—DILATATION IN SIMPLE CASES.—MANAGEMENT OF DIFFICULT CASES.

THE majority of persons suffering from stricture of the urethra are properly out-patients of hospitals, or office patients in private practice, and scarcely ever take to their beds unless positively required to do so by the medical attendant.

When a patient has had, for some length of time, any serious impediment to urination, his functions and vital powers are almost always more or less impaired, and, unless they are to a considerable degree restored before the surgical treatment is employed, a rapid recovery need not be expected; on the contrary, the most untoward result may sometimes be anticipated.

CONSTITUTIONAL TREATMENT.

The surgeon should first ascertain whether there be any complicating disorder; and, if so, to apply the appropriate remedy; and next to devote his attention to the improvement of his patient's general health. To that end he should, in bad cases, where the constitutional symptoms are marked, advise rest in the recumbent posture for a few days, and give a little opium and belladonna at night—either by mouth or in the form of a suppository—to relieve pain, allay spasm, and procure sleep; recommending also a warm hip-bath for five minutes at bed-time;

he may also use hot fomentations to the hypogastrium, or a warm poultice made of four parts of flaxseed meal and one of mustard; or if dry heat be preferred, a small bag of hot salt. These means often greatly relieve the distress caused by existing cystitis. The bowels should first be unloaded by a brisk cathartic, after which a mild aperient may be given every morning. Iron, in the form of tincture of the chloride, from five to ten drops three times a day, is an almost indispensable adjuvant in the treatment of urinary diseases. In some cases of chronic urethritis in the deeper part of the canal, attended with seminal weakness, I have obtained excellent results from fifteen-drop doses, three or four times a day, of a mixture of equal parts of tincture of the chloride of iron, wine of ergot and tincture of cantharides. In cases attended with rigors, from five to fifteen grains of quinine, with a drop or two of Fleming's tincture of aconite, should be given at night. As the acidity of the urine is often a source of great pain and discomfort in diseased conditions of the urethra, it is necessary to administer medicinal substances that have the property of rendering it bland. Among these are some of the salts of soda and potash—eminently the bicarbonate and citrate, and certain medicinal plants, such as buchu, uva-ursi and triticum repens.* I prefer the citrate of potash in doses of twenty to thirty grains, dissolved in half a glass of sweetened water, flavored with essence of lemon, three or four times a day. One of the best of the vegetable diluents is the triticum repens, a quart of the decoction, in divided doses daily. I think it desirable, however, every few days to alternate from citrate of potash to Vichy water, and from Vichy water to the dog-grass decoction, and back again to the citrate; as any one of these diluents too long continued is apt to derange the stomach and bowels. The patient

* Vulgarly known as couch-grass, and also dog-grass.

should have nutritious and easily digested food ; and, so soon as compatible with the exigencies of the case, should take out-door exercise. In cold and inclement weather he should be warmly clad, and should wear flannel next the skin, and avoid getting chilled and wet,—two common exciting causes of retention of urine.

The use of wine and spirituous and malt liquors should be prohibited, except where a moderate amount is absolutely requisite to give strength and assist digestion.

For some time before, and also during the surgical treatment, this course should be pursued.

SURGICAL TREATMENT.

The surgical treatment is demanded in all the stages of stricture, and without it internal medication is of little avail. This already well-known fact is here stated, because there are practitioners who still entertain the idea that if patients, suffering from obstructed micturition due to stricture, be at once put to bed and treated medicinally or even expectantly they will soon get well. In answer to this, it may be said that when patients make a good recovery under such treatment, they have not been suffering from stricture, but probably from temporary obstruction in the deeper part of the urethra, caused by inflammatory swelling, which will frequently subside by rest alone. Those who believe that they cure *stricture* in this way do not usually resort to urethral exploration, without which no diagnosis can be accepted as conclusive.

The surgical methods of treating stricture, now in general use, are: 1. *Pressure and over-distension by sounds, and direct applications to the diseased surface.* 2. *Dilatation.* 3. *Divulsion.* 4. *Internal Urethrotomy.* 5. *External Perineal Urethrotomy.*

Pressure and over-distension by large sounds, and direct applications of various chemical agents to the diseased surface, are used in the formative period. In fully developed stricture, dilatation is usually tried first; if it fails, divulsion is employed, except in obstinate constrictions of the pendulous portion, and those near the external orifice, in which internal urethrotomy should be performed. External perineal urethrotomy is demanded in severe contusions of the perinæum where the urethra is torn across; in narrow unyielding traumatic strictures; in narrow resilient and in impassable strictures with retention of urine; and also for the relief of bad cases complicated with obstinate urinary fistulæ. These several modes of treatment will be successively discussed, beginning with the

TREATMENT OF STRICTURE IN ITS INCIPIENT STAGE.

If patients always applied for relief in the earlier stages of the disease, cutting operations would very seldom be required; but, unfortunately for them, too many defer visiting the surgeon until there is much obstruction to micturition, and perhaps graver complications. It is mostly people of the better classes that seek advice early, on account of annoying gleet discharge, of which they are anxious to be rid. Remembering that chronic purulent discharge is almost always a sure indication of the existence of granular urethritis, which is the formative period of certain strictures, the surgeon should direct his efforts to its cure; and if this is accomplished there will be no stricture—it will be, as it were, nipped in the bud.

To enumerate the devices which have been used for the cure of chronic urethral discharge depending upon stricture were a waste of time and space. Most of them have proved unavailing, and to employ them is to temporize and to do great injustice to patients. The fact that obstinate gleet is an evidence of granular

urethritis, existing in the vicinity of an already formed stricture, or a stricture *in embryo*, having already been pointed out, and the manner of making the diagnosis described, it now remains for me to indicate what are considered the most rational modes of treatment. Taking as an example a case of granular urethritis in the sinus of the bulb, without marked constriction of the canal, that will admit No. 12; instead of losing precious time by employing injections, ointments, medicated "soluble bougies," etc., it is best to begin with the systematic use of conical steel sounds, gradually increasing the numbers to the full capacity of the meatus; introducing but one instrument every second or third day,—never sooner than the second day,—and allowing it to remain in situ for a single minute to make pressure upon the granular surface. If the meatus will admit no larger number than 16, the two-bladed dilator (Fig. 17) which I have devised for the purpose of greatly over-distending the canal at the diseased point, in such cases, does good service.

This instrument is modelled somewhat after Weiss's stricture dilator, but has only two instead of three blades, and is much lighter. The blades are not joined at the vesical end, and are, at that point, so thin and yielding that they cannot act injuriously upon the parts behind the diseased portion of the urethra. The calibre of the shaft is equal to No. 10, and the instrument is really a curved hollow conical sound, split longitudinally so that the two

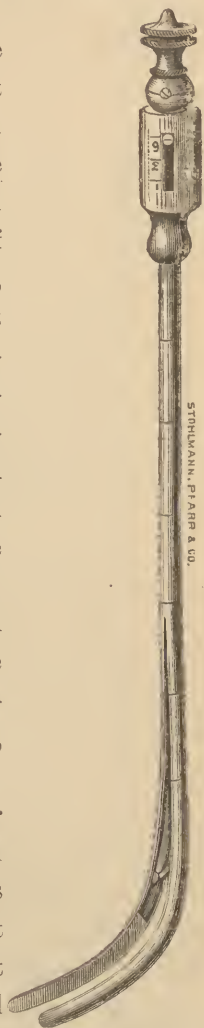


FIG. 17. The author's instrument for over-distending the urethra.

blades are separated laterally by a lever attached to a rod, which is moved by means of a screw in the handle, and when fully expanded the widest part more than equals in circumference the sound No. 20 (thirty-four and a half millimetres). It is graduated in inches, so that the part susceptible of greatest expansion can be made to act on the urethra exactly where it needs to be over-distended. This dilator may be used to distend the canal very gradually, or be made to act as a divulsor by rapidly turning the screw and opening the blades to their greatest extent.

If, after six weeks or two months of treatment by dilatation and expansion, the discharge still persists, a urethroscopic examination should be made, and the granular surface touched with a solution of nitrate of silver or of some other appropriate chemical agent. I have thus succeeded in some cases that had long resisted pressure and over-distension. The following two cases will serve to illustrate this method of treatment:—

CASE 1st was a gentleman, between twenty-five and thirty, who for several years had suffered from chronic urethral discharge as a sequel of gonorrhœa. Exploration of his urethra with bulbous bougies revealed a stricture $\frac{1}{4}$ of an inch within the external orifice, and a sensitive spot five inches back. The stricture near the meatus was incised, and a No. 17 conical steel sound was passed into the bladder every third day for several months, but the gleety discharge continued the same as before. In November, 1865, I made an examination of his urethra with Désormeaux' endoscope, which showed granular urethritis for the space of a quarter of an inch, at the distance of five inches from the external orifice, corresponding to the tender spot above mentioned. This was touched with a solution of nitrate of silver, thirty grains to the ounce. On the following day the patient had considerable scalding in micturition; in two days the discharge had increased so much as to resemble a gonorrhœa, but this gradually subsided, and in ten days it had ceased completely. I saw him two years after, and he informed me that he had had no recurrence of his trouble.

CASE 2d was under treatment at about the same time, and its history is similar to the preceding, but the solution used at first was only ten

grains to the ounce, and was not followed by inflammatory symptoms; it was, however, gradually increased in strength to thirty grains to the ounce, the parts having been brought to tolerance. The patient remained under my care for three months, and twenty-four applications had to be made before the cure was effected. He has ever since been free from gleet.

The obstinate form of granular urethritis should, in many instances, be treated on the same general plan as granular lids; the topical applications indicated in the one will answer well for the other with slight modifications. For instance, the solutions and other agents designed for the urethra should be weaker than those for the lids. If the solid stick of nitrate of silver be used, it should be the mitigated—one part of nitrate of silver to four of nitrate of potash—and it should be used as lightly upon the granulations in the urethra as upon those of the lids, and always through the urethroscope. Désormeaux recommends the sulphate of copper among other agents. The red oxide of mercury well incorporated with glycerole of starch in the proportion of two grains to the drachm, so useful in granular lids and vascular cornea, might be applied to the diseased surface with advantage in cases that resist the other means. Before making any application, the granular surface should be carefully wiped with a small wad of cotton.

DILATATION.

The great majority of strictures of the urethra should be treated by dilatation, other means being justifiable only in case of failure of this simplest and safest of all methods; and in fact, all other modes of enlarging the canal are only preliminary steps to the application of proper dilators,—which are bougies and sounds,—for after divulsion and the urethrotomies, the dilators must always be used to insure calibration and permanent relief. Simple cases of stricture fully developed, but amenable to dilatation, should be

treated after the manner described below. Having ascertained the calibre of a constriction—admitting No. 3 bulbous bougie—which we shall suppose to lie in the sinus of the bulb, a No. 4 soft olivary bougie * (Fig. 4) should be gently insinuated through the stricture, and onward until it has entered the bladder, and can be easily moved back and forth without giving much pain—its point being free is an additional evidence that it has reached its destination. The instrument should at once be removed, lest it give rise to undue irritation. The surgeon should be satisfied with this for the first sitting, and interfere no more, if all goes well, until the third day, when the same bougie, and then another, a number larger, should be passed; increasing the size, in this manner, every third or fourth day until the number is reached that will fill the meatus without giving pain. If it be No. 13 or 14, the dilator (Fig. 17) should be carefully introduced, and the screw turned until it indicates No. 15; one additional turn to be given at each succeeding sitting until No. 20 or more shall have been reached. If the patient lives at a distance it will be well to incise the mea-

* Until the middle of the last century all kinds of medicated bougies, supposed to possess a specific influence upon the diseased parts, were resorted to, but it was finally demonstrated that they only acted as dilators. Various dilating bougies were then brought into use, which were made of substances susceptible of considerable expansion by moisture, such as catgut, slippery-elm bark, etc. The catgut bougies were first used by Plenck in Europe in the latter part of the last century, and the slippery-elm bark in our country in the beginning of this century. These instruments were introduced into the urethra, and left in situ until it was supposed that they had absorbed sufficient moisture to expand and dilate the stricture. As there is usually less moisture at the seat of a stricture than at the uncontracted portions of the canal, the bougies expanded much more in front and behind the obstruction, and their withdrawal was very painful and often attended with laceration of the urethra; consequently they had to be abandoned. All the dilating bougies have met with the same fate as Lioult's "*bougies adaliques*," which that surgeon attempted to introduce into France in 1828. For the last few years the use of *luminaria digitata* bougies has been greatly urged, but this substance is open to the same objections as catgut and slippery-elm. They have been largely employed in England and in this country, and wisely abandoned as worse than useless by the majority of surgeons.

tus freely so that it will admit No. 16 or 17, and to direct him to pass an instrument every two or three weeks for one or even two years; and the great probability is that he will remain well if prudent and sober. I believe that nothing short of great over-distension of the strictured part will insure permanent relief.

Extent to which a Stricture should be dilated.—It is often said that if a No. 10 or 12 instrument is passed into a man's bladder he cannot have stricture; this is a very common error into which too many intelligent practitioners have fallen. Indeed an adult may have a perfectly healthy urethra so small as to admit only a No. 8 or 9 sound, but this is extremely rare. The normal average in the narrowest part of the urethra, i. e., the meatus, is equal to No. 14; but even then, a stricture in its formative period may exist in the canal, and still admit No. 14, and escape detection unless proper means be taken for its discovery. Another man's urethra may admit No. 16, 17, or even 18, and be constricted. The extent, then, to which dilatation is to be carried should depend upon the normal calibre of the canal in each individual case. The introduction of No. 12 may cause extreme over-distension in some cases, while in others it may not make the slightest impression upon the urethra, which may require distension to No. 20 or 22 at the seat of disease.

MANAGEMENT OF DIFFICULT CASES.

Most of the cases of stricture seen in private practice are amenable to dilatation, but occasionally narrow constrictions, very difficult to enter, are met with; they are principally those with eccentric orifices, the tortuous, and all that are complicated with false passages, the result of forced catheterism applied either designedly or through recklessness or ignorance of the use of instruments. In case of difficulty in overcoming the obstruction,

Dupuytren recommended the passage of a sound or bougie down to the stricture to make pressure against its face for several hours. This method, which was called "vital dilatation," and which, unfortunately for patients, is still in use, only serves to do much mischief. It was introduced at a time when urethral instruments were rude, as compared to those now in use, and when surgeons did not properly appreciate the necessity of extreme delicacy and gentleness in the management of like cases.

Catheterism in Eccentric Strictures.—One of the most common causes of failure of catheterism, in very narrow strictures, is eccentricity of the orifice of the constriction. An instrument whose point is firmly pressed directly in the central axis of such a strictured canal must do one of two things; either tear the mucous membrane and make a false passage, or else push it back in the form of a *cul-de-sac*.

The diagram, Fig. 18, borrowed from Boeckel, will give an idea of the last named condition.

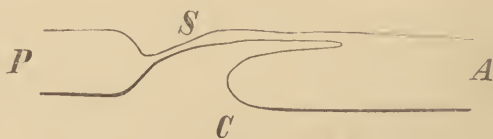


FIG. 18.

- A, represents the Anterior Part of the Urethra.
 P, the Posterior Extremity.
 S, the Stricture.
 C, the Cul-de-sac produced by sounds or bougies.

If the above-mentioned facts be kept in view, many strictures supposed to be impassable, will be readily entered by properly constructed fine bougies. It seems strange that so little heed is given to such instruments, since the attention of the profession has twice been called to them by eminent experts; first by Benjamin Bell, who, nearly eighty years ago, advised the use of the abruptly bent bougie (Fig. 19), for the penetration of eccentric

strictures,* and in our own time by Leroy d'Etiolles, who invented the spiral instrument (Fig. 20), for catheterism of eccentric and tortuous strictures, and published many cases successfully treated according to his method.†

Though the soft bougies of Leroy answer well in many cases, I have often verified the fact that the instrument coiled in front of the stricture, and sometimes doubled itself so that the point appeared at the meatus when it was believed to have passed into the bladder; these very common failures are due to the too great flexibility, and to the want of *spring* of such bougies. For these reasons I have, for many years, used in their stead slender probe-pointed shafts of whalebone (Figs. 19, 20), which possess great advantages over both the French and English capillary gum bougies, being more elastic than either of the latter, and less liable to coil in the urethra, while they adapt themselves admirably to the inflections of the canal, and can be made so small as to enter the narrowest constrictions. The size mostly in use is two-thirds of a millimetre in the shaft, the next is half a millimetre; they can, however, be reduced to the size of horse-hairs, and still be sufficiently strong.‡ They are ordinarily twelve inches long, but I have had some made of double that length. The points of these

SHEPARD & DUDLEY N.Y.

* A Treatise on Gonorrhœa Virulenta and Lues Venerea, by Benjamin Bell. Edinburgh, 1793, vol. i., page 296.

† Sur les avantages des bougies tortillées et crochues dans les rétrécissements et angusties de l'urètre difficiles à franchir. Par le Dr. Leroy d'Etiolles, Paris, 1852.

‡ Small whalebone bougies were well known to Dr. Jameson, of Baltimore, who speaks of them—"the size of a small knitting-needle"—in a paper on stricture, published in the *Medical Recorder*, 1827.

FIG. 19. FIG. 20.

delicate instruments retain the bend or twist given them if they are dipped into boiling lard oil and suddenly cooled in water. The mode of using them is as follows: They are so slender that they cannot be properly oiled; it is therefore better to fill the urethra with warm benzoated olive oil; then if the stricture be eccentric, a bougie with Bell's bend (Fig. 19) is to be introduced, with the point directed toward the floor of the canal in order to avoid its entering the *lacuna magna*. The direction of the point may be changed so soon as it has gone beyond the lacuna, but should it then enter another lacuna it must be slightly withdrawn, turned aside, and carried onward until it meets the final obstruction. From this moment it becomes an explorer in search of the orifice of the stricture, to find which is not, as has been asserted, "a mere matter of chance," but a procedure requiring very light fingers, with great delicacy of touch, and much experience and skill. To be sure of entering the mouth of a narrow eccentric stricture, the point of the bougie should be kept in contact with the urethral wall, while a slight to and fro movement is given the instrument until the stricture is entered or the whole circumference of the canal is explored. The instrument should be bent at both ends in exactly opposite directions (Fig. 19), that the distal may indicate the position of the vesical extremity, and consequently the situation of the orifice of the stricture.

After the bougie has been passed through the stricture it should be movable back and forth, otherwise it is almost certain that the point is caught in one of Cowper's ducts, in one of the many enlarged lacunæ in the ampulla behind the stricture, in the utricle, or in one of the ejaculatory ducts. At this stage of the proceeding it is necessary to exercise much caution and gentleness in disengaging the instrument from its faulty position, as any undue force will give rise to a false passage, or excite inflammatory

action which may extend to Cowper's gland or to the testicle;—these accidents are just as liable to occur from the use of ordinary capillary bougies. By withdrawing the instrument a quarter of an inch, or even less, and giving it a slight rotary movement to change the direction of its point, and then pushing it gently onward, the obstacle will be surmounted and the bladder entered, which is known by the freedom of the point of the bougie on repeating the back-and-forth movement. Having reached the bladder, the bougie serves as a conductor upon which a peculiarly constructed sound is made to glide and dilate the canal, and also straighten it if the stricture happens to be tortuous. This last-named instrument was suggested by me in 1864, and I have since used it very much and with great success. It is a grooved conical steel sound (Fig. 21) with a canal one-eighth of an inch in length at the vesical extremity, and with a curve equal to one-fifth the circumference of a circle three and a quarter inches in diameter. The smallest (No. 3) is one and a half millimetres in diameter at the point. I have had larger ones (to No. 15) made to fully dilate strictures complicated with false passages, and have named them *tunnelled sounds*. When a capillary whalebone guide has passed through a tortuous or an eccentric stricture and has entered the



FIG. 21. The Author's tunnelled sound with a whalebone bougie in position.

bladder, the free end is slipped through the tunnel of the smallest sound, which is carried down to the obstacle, held in firm contact with it,—precaution being taken to keep the guide in the groove of the staff,—and in a few moments the instrument will pass, but no force or undue pressure should be used. It is desirable, after having accomplished this much, to carry on dilatation rapidly, at the same sitting, to four or five higher numbers, to guard against the possibility of retention of urine from too great inflammatory swelling.* The stricture should then be treated by gradual dilatation, and no other method thought of, unless dilatation fails after a thorough trial.



FIG. 22.

In 1869 I adapted the tunnelled principle to the one-eyed

* This method of catheterism is, I believe, an improvement on the old French mode of catheterism upon a conductor, devised by Desault, on the method of Wakley, and on the more modern device of Maisonneuve, which he terms *cathéterisme-à-la-suite*, with a small gum bougie, which so often coils up in front of the stricture instead of entering it. This very flexible guide has been adapted by Maisonneuve to his urethrotome, and is very liable to be cut across by the blade of the instrument. Voilemier has also adapted it to his divulsor. Here again it has similar disadvantages, and will meet with very little favor. But the whalebone guide adapts itself perfectly to the curves of the urethra, and is applicable to the catheterism of constrictions situated either in the pendulous portion or in the sub-pubic curve of the canal. I originally employed as guides to the steel staffs the fine English bougies, which are stiffer and therefore better for that purpose than the French, but now I use the whalebone almost exclusively.

Dr. F. N. Otis has also lately improved Desault's method of catheterism by substituting a whalebone for the metallic conductor, and employing very small catheters. He uses a whalebone bougie of double length, and having introduced it, threads the catheter (Fig. 23) upon the guide, and when the former instrument has entered the bladder, the latter is removed, and a small glass syringe is applied to the distal end of the catheter for the purpose of drawing a few drops of urine, and thus ascertaining positively that the point of the catheter is in the bladder.

English gum catheters (Fig. 22), and have used them with much satisfaction and success. The whalebone guide is passed through the vesical extremity of the instrument, which is open, and out of the eye. Their use is especially indicated when, after having made rapid dilatation of a narrow stricture, it is found necessary to retain a catheter for a few hours.

The Caustic Treatment—so much in vogue in the times of John Hunter, Sir Everard Home, Whateley, Sir Charles Bell, Ducamp, Leroy d'Etiolles, and others—I here mention, only to say that it is justly condemned by the best living authorities.

Electrolysis has, within a few years, been called in aid in the treatment of stricture, but even in the hands of its warmest advocate, Dr. Mallez of Paris, little if any good has been accomplished by its use. My friend Dr. Meredith Clymer, who was the first in this country to put it into practice, tells me that his results, in stricture, were worse than negative, inasmuch as, besides failure in destroying the stricture, the pain it gave was insupportable. The electrolytic treatment has been tried by Dr. Keyes at the Charity Hospital, in, I think, nine cases, with no better results. What it is destined to accomplish in the future, I will not venture to predict.

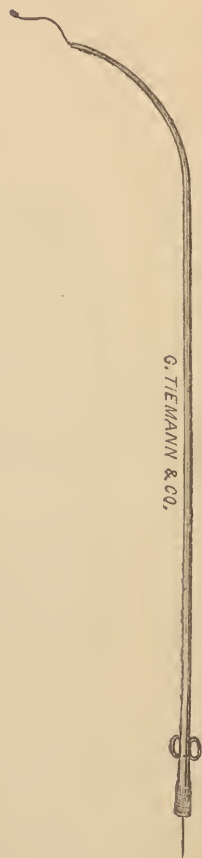


FIG. 23. Dr. Otis' dilating catheter threaded upon the whalebone guide-bougie.

CHAPTER IV.

TREATMENT OF STRICTURE BY DIVULSION.

WHEN narrow constrictions of the deeper part of the urethral canal are so dense or so resilient that they cannot be overcome by dilatation, other means have to be sought for their relief. To cure these intractable strictures without the knife has been, for many years, the aim of progressive surgeons, and to accomplish this end they have proposed numerous plans. Among them are the caustic and electrolytic methods, which thus far have not stood the test of practical application. A simpler method, and one at the same time attended with less danger, has, I think, been found in longitudinal divulsion, which is a method both rapid and safe. *The term divulsion* has long been known in surgical parlance, but seems to have been employed only within a few years (first by Voillemier) in this connection. It is derived from the Latin *divello*, which means, "I pull asunder," or rend, and expresses rupture, laceration. It should be used in preference to the word *rupture*, which has already the accepted signification of accidental laceration from violence, as in injury of the perinæum, or in the giving way of the urethra behind a stricture, as for instance, "rupture of the urethra followed by extravasation of urine." The English surgeons still adhere to the terms to "rupture" or to "split" a stricture, and yet they name their instruments "dilators." If the strictures are "ruptured," "lacerated," or "split," the better names for the instruments would be rupturers, lacerators, or splitters, and not "dilators." The terms to divulse, divulsion, divulsor, are, I think, greatly to be preferred. To treat a stricture

by divulsion is to make a longitudinal rent of the constricted portion of the urethra. This may be accomplished by the successive introduction of conical sounds—which act on the principle of the wedge—beginning with small ones, or by any of the various divulsors, improperly called dilators, which are now in use. These are Perrève's instrument and its modifications by Holt (Fig. 24), Richardson of Dublin, and Voillemier (Fig. 25); Michéléna's and Sir Henry Thompson's, and their modifications. The simpler the instrument, the better. The method of treatment by divulsion is more thoroughly understood and appreciated in our time than when the early "dilators" were brought into notice. What has been done and is doing in that direction will now be briefly reviewed.

In the early part of this century, Mr. Luxmoor, an English surgeon, employed a four-bladed instrument to "dilate" strictures; later, Mr. Weiss, a surgical instrument maker, of London, constructed a two-bladed instrument (first used by Sir Astley Cooper) for the extraction of small calculi of the urethra and bladder; this suggested to him a three-bladed "stricture dilator"—a drawing of which appeared in his catalogue of surgical instruments published in 1831. Mr. Guthrie claims to have been the first to use this "dilator." The instrument has an olivary point about equal to No. 5 of the English scale, and its blades, free at the extremity, are opened by means of a lever, which is moved by a screw in the handle. But these instruments are too clumsy, too large, and cannot be applied to very narrow constrictions.

In 1847 appeared Dr. Michéléna's thesis on stricture, with a description and engraving of a "dilator," consisting of two blades, free at the extremity, and acted upon by a series of levers. In 1849 Mr. Rigaud published, in the *Gazette Médicale de Strasbourg*, a description of a similar instrument, and the two are sometimes confounded. In Mr. Rigaud's dilator the blades slide

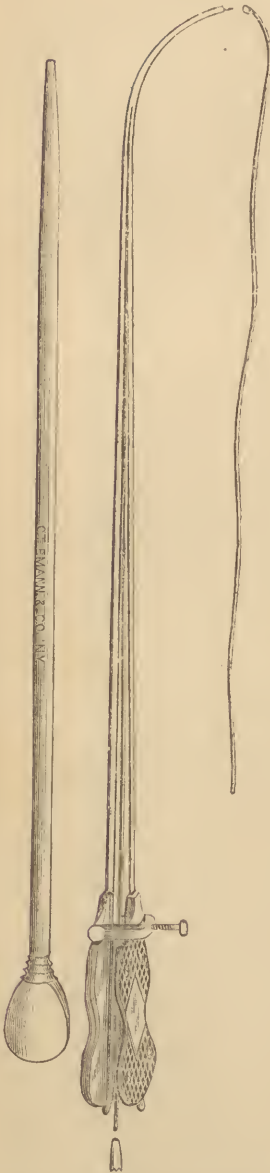


FIG. 24. Holt's modification of Perrève's Divulsor, with Maisonneuve's conductor.

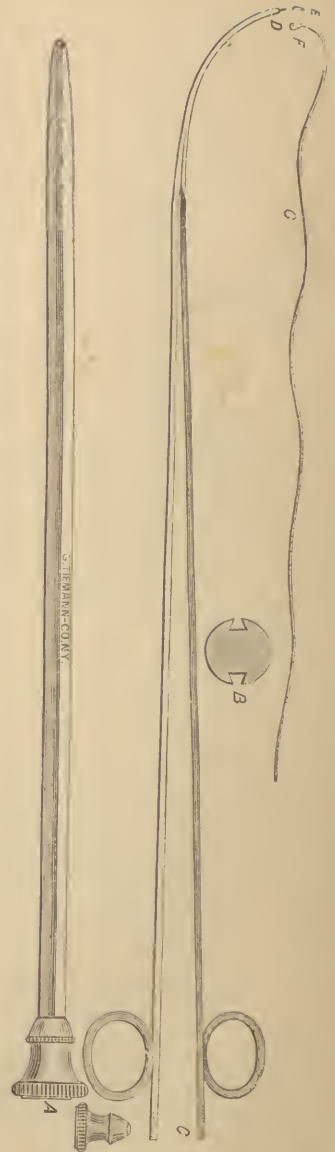


FIG. 25. Voilemier's modification of Perrève's Divulsor, with Maisonneuve's conductor.

upon each other while they are being opened, but in that of Dr. Michélena they preserve their parallelism.

To M. Perrève, of Paris, is due the credit of having devised and employed a "dilator" with a short, delicate conducting gum bongie attached to its extremity, and intended to penetrate very close strictures complicated with false routes. This instrument consists of two slender blades, between which rods of different sizes are introduced, according to the degree of dilatation the operator intends to make. His first "dilator" (without conductor) was devised as early as 1835. Many years later, Mr. Bernard Holt, of London, used the same instrument (Fig. 24) with some modifications, first, as he supposed, only to *dilate* the urethra. Two other surgeons, Richardson and Voillemier, have modified Perrève's instrument, but without altering the principle of action.

In the *Medical Times and Gazette*, May 2, 1863, will be found a description of an instrument devised by Sir Henry Thompson for the treatment of stricture of the urethra by "gradual distension at a single sitting," even "beyond the natural calibre of the canal." But divulsion must have taken place, inasmuch as hæmorrhage had always occurred after this so-called "gradual distension." The instrument has the merit of being very simple in construction, and, as I think it meets nearly all the requirements of a divulsor, I prefer it to the others. By means of a single lever, the two parallel rods are made to "separate so as to form a long oval or spindle-shaped figure," the greatest diameter of which will correspond to the seat of the stricture to be "dilated," and equal, in circumference, No. 18 of the English catheter scale, or even more. In the third edition of his treatise on stricture, Sir Henry Thompson speaks of the instrument as suitable for the performance of divulsion. Believing the original "dilator" to be too large for the treatment of very narrow strictures, I have had it reduced in size, and have modified it so that

it can be used with a conductor. The dimensions of the instrument, represented in Fig. 26, are, 2 millimetres at the extremity, and $3\frac{1}{2}$ millim. at the part susceptible of greatest expansion. Its diameters can be further reduced without any impairment to its strength. Another important modification I have made is in the blades, which, instead of being flat or guttered on their inner sur-

face for the first two inches from the point, are cylindrical, so that the urethral mucous membrane cannot be pinched and torn in withdrawing the divulsor,—an accident that I have known to occur even when the precaution of not entirely closing the blades was taken. The curve of the instrument should not exceed one-fifth of the circumference of a circle three inches and a quarter in diameter.

Those who have a preference for any of the other divulsors, may have them modified so that they be used with a conductor. It matters little what kind of an instrument is employed, providing the principle of divulsion be carried out, and a safe and easy cure effected. Different operators will have their fancies; thus Amussat, Leroy d'Etiolles, Heurteloup, Civiale, Reybard, and Mallez have devised each his "dilator," and there are others too numerous to mention.

In studying Mr. Perrève's cases, published in his treatise of 1847, it will be noticed that in nearly every one the occurrence of hæmorrhage is reported; sometimes only to the extent of a few drops, generally more, depending upon the size of the rod introduced. M. Perrève did not *dilate*, as he claims, but did *tear* these strictures, hence his success. Mr. Holt, in the second



FIG. 26. The author's modification of Thompson's divulsor.

edition of his book on the "Immediate Treatment of Stricture," speaks of "*a new stricture dilator*," but afterwards confesses that he preferred to "*split*" the strictures, as the partial dilatation he had before made had given rise to "stricture fever." He was perhaps the first to prove that there was laceration instead of dilatation, as he had an opportunity to verify this in one of his own patients, at the dead-house, where there was found a longitudinal rent along the floor of the urethra at the seat of disease. Extensive experience has since taught the profession that nothing short of complete divulsion of the stricture will insure success, and that after all it amounts to about the same thing as an internal urethrotomy; but it is a safer operation. Therefore Sir Henry Thompson's precept of *stretching* as much and *tearing* as little as possible might well be reversed, and I will venture to say, *tear* as much and *stretch* as little as possible, and the results will be all the better.

We should not deceive ourselves by believing that the urethral mucous membrane is only stretched, and that the part torn is the inodular substance in the sub-mucous tissue,—an idea recently advanced. I believe that the mucous membrane is nearly if not always involved in organic stricture; it should be, and is, torn by the divulsor. Union by granulation takes place, and the mucous membrane grows over the cicatricial splice precisely as does the skin over a cicatrizing ulcerated surface. Hence the necessity to continue indefinitely the periodical introduction of large-sized instruments. We should never neglect to recommend the use of the sound after this or any other method of treating narrow strictures of the urethra. The exclusive advocates of divulsion promise too much, and the unwary are apt to fall into that error. Prudent and judicious surgeons should not be wedded to any particular method of treatment, but should adopt whatever plan should seem best suited to a given case. It requires more

judgment to decide upon the mode of treatment best adapted to a particular case, than skill to carry it out.

Indications and Contra-Indications.—Now come two very important practical questions: 1st, to what class of cases is divulsion applicable; and 2d, where is it contra-indicated? The second question will be answered first. It is not, as a general rule, to be used in narrow traumatic strictures, in obstructions complicated with extravasation of urine, in the dense intractable constrictions of the pendulous portion of the urethra; but it is known to answer well in nearly all cases of great urgency where the strictures are situated in the scrotal and perineal portions of the urethra, and generally those which do not possess the features described among the contra-indications.

I will now cite some illustrative cases, treated by divulsion, in my own practice. I have arranged them in groups, that the points which they teach may be the more readily seized.

The first group is intended to show that divulsion and not dilatation takes place when an attempt is made to enlarge suddenly a strictured urethra from within, and that the mucous membrane as well as the sub-mucous tissue is torn. Cases II. to V.

The second, that divulsion can be effected by the cautious and gentle use of conical sounds. Cases VI. to IX.

The third, that divulsion of certain strictures in the pendulous portion of the urethra is occasionally followed by fair results. Cases X. to XII.

The fourth, that divulsion is sometimes necessary in strictures that have been dilated to a considerable extent, but in which catheterism is followed by rigors and other discomforts. Cases XIII. to XVII.

The fifth, divulsion without conductor. Cases XVIII. to XXI.

The sixth group, divulsion with conductor. Cases XXII. to XXXII., and also Case I.

CASE I. Stricture of thirteen years' standing from gonorrhœa. Retention of urine. Divulsion upon a conductor. Good result.

For the details of this case, see Chapter IX.

Group 1st.—Consists of four cases, in which the urethra was examined with the greatest care after death.

CASE II. During the spring of 1868, I was summoned to the hospital at night to see a man about 45 years of age, who had been suffering from retention of urine of thirty-six hours' duration. This was the consequence of a stricture of many years' standing, which had been treated at irregular intervals, by dilatation. When I arrived at the hospital I learned that repeated trials to relieve him had been made, but with no effect. I found the patient under the influence of ether, while the house surgeon was making an attempt, with a filiform bougie, to get through the obstruction; and the patient was bleeding considerably. Exploration with bulbous bougies revealed the existence of an extensive false passage, and also of a narrow stricture at the bulbo-membranous junction, through which a No. $\frac{1}{8}$ whalebone bougie was passed and over this Nos. 4, 5 and 6 tunnelled sounds were introduced, and then Sir Henry Thompson's "dilatator;" afterwards a silver catheter, No. 10, was passed, and one pint and a half of bloody urine drawn. He died on the following morning, about eight hours after I saw him. On post-mortem examination, the bladder was found greatly hypertrophied and inflamed, and the ureters and kidneys were in an advanced state of disease. In the urethra there was a false passage four inches in length, extending from about three inches behind the external meatus to the prostate. The orifice of the false route was upon the floor of the canal, a little to the left of the median line, and was large enough to admit a No. 6 instrument. A number of short longitudinal rents were found through the mucous membrane at the seat of the stricture, mainly on the floor of the urethra. Divulsion was not done here as a means of cure, but merely to make way for the introduction of an evacuating catheter; he was in a hopeless condition, but it would scarcely have been humane to allow him to die unrelieved, and surely the death is not chargeable to the operation.

CASE III. (Bellevue Hospital, May 27, 1868.)—Wm. L., aged 32, was received into the hospital on account of dysury from a stricture ($4\frac{1}{2}$ inches down) of seven years' standing. He had had numerous attacks

of retention of urine, and had been suffering much from dribbling. His urethra was unusually sensitive. Dilatation failed, and divulsion without guide was done, and No. 10 sound passed. Four days after the operation he had rigors, and was extremely nervous and sensitive. On the fifth day he became delirious, and died pyæmic. A number of secondary abscesses were found in the lungs. In both kidneys there were also several abscesses. The pelves of the kidneys and the ureters were considerably dilated, and contained some slimy dark-colored pus. The bladder had undergone concentric hypertrophy, and its mucous membrane was in a state of chronic inflammation. The urethra having been laid open along its upper surface, a number of oblique and longitudinal slits or rents were found, mainly upon its floor at the seat of obstruction, and extending backwards to the bulbo-membranous junction. The rents were from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in length, and involved the mucous membrane, which was somewhat thickened.

CASE IV. (October, 1869.) G. P.—I was called to the medical wards of the hospital to examine this patient, and to relieve him of supposed retention of urine of two days' standing. The man was thirty years of age, and was suffering from rheumatic arthritis; his first seizure of rheumatism had come on twelve years before, and he had had in all six attacks. He stated to me that he had no desire to pass water, and had experienced none for two days. His mind seemed clear, and he conversed well. He had gonorrhœa many years before, and had not for several years voided a full stream of urine. There was neither pain on pressure nor dulness upon percussion in the hypogastric region. Examination with bulbous bougies revealed a constriction, through which No. 2 could not pass, one inch and a half from the external orifice. As it was desirable to pass a catheter to give precision and certainty to the diagnosis, a whalebone guide was first introduced, and over it No. 3 tunnelled sound, and then No. 4; a little hæmorrhage ensued, and the tunnelled catheter was passed, but only half an ounce of high-colored urine flowed. I then expressed the opinion that it was without doubt a case of suppression of urine, and advised dry cups and fomentations to the lumbar region, and a diluent drink, but not more than an ounce of urine was passed in the three days which he survived. Two days after I saw him he had symptoms of uræmia, and soon became comatose. Post-mortem examination showed his kidneys to be granular and much contracted, but his ureters and bladder were healthy. The urethra was slit open, and at the seat of stricture there was a longitudinal rent of

the mucous and submucous membranes along the floor of the urethra, and about one inch and a half in length; this rent, with the exception of two slight bands which extended across its middle, was nearly as straight and almost as sharply cut as if it had been done with the blade of a urethrotome. (Fig. 27.) Divulsion was not here done as a means of cure, but of diagnosis, for if the case had been a proper one, internal urethrotomy would have been employed in preference.



FIG. 27.

CASE V.—Edw. K., aged 60, had had a number of attacks of retention of urine, and had for a long time been able to pass but a very small jet of urine. He was brought to the hospital with a fracture of the left thigh, and was at the time suffering from dribbling of urine, and no instrument could be introduced. I found a stricture $5\frac{1}{2}$ inches down, which admitted only a capillary bougie. Divulsion was done with the modified Thompson's instrument. Hæmorrhage moderate. No. 15 sound once a week. In the course of two months the fracture united and he was up, but afterwards became bedridden. He complained of headache,

was seized with vomiting on several occasions, and finally came a low muttering delirium with increase of habitual tremor. The heart and lungs were normal, but the pulse was feeble, irregular, and intermittent. No organ could be fixed upon with certainty as diseased. He died three and a half months after the operation. The autopsy revealed a low grade of peritonitis, the abdominal viscera were glued together by recent lymph as well as old adhesions; no other lesion was observed. There had been no abdominal pain or tenderness during life. Ureters normal. The bladder was a little thickened. Prostate slightly enlarged. The divulsed portion of the urethra extended from the point of obstruction to one inch and a half backwards, and was one-eighth of an inch more in circumference than the healthy canal in front. Traces of several longitudinal rents were observable on the floor of the urethra, but showed firm cicatrization.

Group 2d.—It has already been stated that divulsion could be accomplished by the successive introduction of conical sounds, beginning with small ones, by means of instruments consisting of two parallel halves, which can be separated either by a lever or set of levers acted upon by a screw at the extremity of the handle, or by rods which are introduced between the segments of the divulsor. The four cases mentioned below will serve to illustrate the manner of proceeding with the first-named method.

CASE VI.—C. H. H., a gentleman from the West Indies, aged forty-two, called upon me, early in 1867, to be treated for a stricture of twenty years' standing. He had been suffering for several years from painful and frequent micturition, and with much straining could only pass an exceedingly small stream of urine, or sometimes a succession of drops. He had on numerous occasions been catheterized with small bougies, but his bladder had never been entered. His medical attendant gave him a small flexible instrument that he might pass it himself; but he became extremely nervous, and his urethra was so irritable that he feared to make the attempt. In that state he came to me. On examination it was found that the smallest bulbous bougie would not enter a constriction situated in the sinus of the bulb. No. 1 English flexible bougie also failed to pass, but I succeeded with a slender whalebone guide, and introduced over this conductor the smallest of my tunnelled

sounds, then a second, and finally a third. He was so nervous and irritable that I concluded to complete the operation at another sitting, and ordered a hip-bath, some quinine, and a diluent drink. He returned in three days, and the manœuvres employed before were repeated until a No. 12 could be introduced. Hæmorrhage to the extent of half a drachm occurred. At the third sitting, wishing to pass larger instruments, I had to make a free division of the external orifice, which was painfully stretched by the No. 12 sound. After this Nos. 14 and 16 were introduced. He had no chill or fever after either sitting. The patient has remained well ever since, but an instrument (No. 14) was introduced for the first year once a week, and subsequently only once in two or three months.

September, 1872.—This patient is still enjoying excellent health, and is catheterized but once in six or eight months.

CASE VII.—On the 19th of October, 1866, F. R. applied to me, complaining of dysury from stricture consequent upon a gonorrhœa contracted fifteen years previously, and aggravated by a second attack fourteen years after the first. He had a retention of urine two years prior to my seeing him, which was relieved by the catheter. Exploration with a “bougie-à-boule” showed a stricture within the external orifice which would not admit of No. 10, and another, $5\frac{1}{2}$ inches back, through which only No. 1 would pass. An elastic English bougie, No. $\frac{1}{4}$, was introduced into the bladder and a tunnelled sound slid over it; after moderate pressure the sound passed the stricture, and was followed by others up to No. 6.

October 22d, Nos. 6 and 7, and then successively Nos. 8, 9, and 10 sounds were passed; this was followed by a slight hæmorrhage. Diluent, rest, etc.

October 26, No. 11 could not be tolerated by constriction near the external orifice; on this account a free incision was made with Civiale’s “bistouri caché,” and then 11 and 12 were introduced into the bladder. On the 28th, No. 15 was passed. The sound was introduced at intervals of a week at first, but afterwards only once in six weeks or two months. He has since had another gonorrhœa. He called about a month ago (over three years after the operation), and his instrument was passed with ease.

September, 1872. He is perfectly well: the instrument is passed every three or four months.

CASE VIII.—Wm. D., aged 70, was admitted to the hospital May 10,

1867, with retention of urine of twenty hours' standing. He said he had been suffering from stricture of the urethra, from gonorrhœa, for forty years, and that he had been treated by dilatation on several occasions. He had contracted another gonorrhœa seven years prior to his coming to the hospital, since which his stricture had given him more trouble, and caused several attacks of retention. On examination, his bladder was found greatly distended, and fruitless attempts had been made to relieve it. The bulbous bougie revealed a stricture $5\frac{1}{4}$ inches from the external orifice, through which only a capillary spiral whalebone bougie could pass. Upon this conductor Nos. 4, 5, and 6 conical tunnelled sounds were successively introduced; the stricture, thus far only stretched, was divulsed by the passage of larger conical instruments to No. 12. A gum catheter was then passed, and three pints of urine drawn. The bladder was found atonied, and treated accordingly. Sounds to No. 15 were used every few days. He was discharged on June 1st, 1867, in excellent condition, and making a good stream of urine at normal intervals.

CASE IX.—(Bellevue Hospital, August, 1867.) J. McM. Narrow stricture three inches from the external orifice, from gonorrhœa and from a bruise of the urethra. Several retentions, unsuccessful catheterism, false passage, dysury, dribbling from overflow, retention. Divulsion upon whalebone conductor, with tunnelled sounds. Instruments introduced to No. 8, and subsequently increased. Good result. Case XII. is a good illustration of successful divulsion with conical sounds, after recontraction had followed the use of the two-bladed divulsor.

Group 3d.—Three cases of stricture in the pendulous portion of the urethra treated by divulsion.

CASE X.—(March, 1869.) R. S. P., a gentleman forty years of age, came to consult me for a stricture of long standing, with urinary fistulæ. I was about to perform upon him the external perineal division for an obstruction $4\frac{1}{2}$ inches back, but found that only No. 4 bulbous bougie could pass a stricture $2\frac{1}{2}$ inches from the meatus; I therefore divulsed it freely with the modified Thompson's "dilator," and was then able to go on with the proposed operation. In the course of six weeks he left the city, after having learned to pass for himself a No. 12 sound. I heard from him four months subsequently, and he was doing well.

CASE XI.—(Bellevue Hospital, April, 1869.) F. B., on whom I had performed external urethrotomy for a stricture in the perineal portion, and, some months after, internal urethrotomy for a constriction $3\frac{1}{2}$ inches from the meatus, having neglected the use of the sound and committed all sorts of excesses, reappeared eight years afterwards with fistulous openings and a very tight stricture at the seat of the last operation; for this I tried divulsion with Thompson's instrument without guide, after having dilated the stricture to a sufficient extent to admit the divulsor. In about two months he was discharged from the hospital, and was passing No. 14 sound.

CASE XII.—(Bellevue Hospital, October, 1869.) K. P., aged 38. This man entered the Hospital on account of dysury, with constant dribbling in the intervals of micturition, which was very frequent. He had had five or six gonorrhœas in the space of eighteen years, but did not suffer in consequence till about a year ago, when symptoms of obstruction appeared. I first examined him on the 16th of October, and found a dense stricture $2\frac{3}{4}$ inches from the external orifice. At a point corresponding to the constriction, an induration extending back half an inch could be distinctly felt from without. A whalebone conductor was introduced, and tunnelled staff No. 4 passed down to the stricture, but failed to make any impression upon it. No. $\frac{1}{2}$ elastic bougie went through, and was retained in position three hours, and No. 1 was substituted, then No. $1\frac{1}{2}$, and finally No. 2. Complete divulsion, to No. 18, was afterwards done with the modified Thompson's "dilator." No. 12 sound was used every second day until November 9th, when No. 10 only could be passed. The tendency to re-contraction was becoming stronger, and on November 22d it was decided to repeat divulsion, but with conical sounds instead of the two-bladed instrument. Accordingly No. 5 was introduced; it was firmly grasped at the strictured point, then 7, 10, 12, 14, and 16 were cautiously passed. Free hæmorrhage followed. No chill or other accident supervened. The passage of urine caused a little smarting at first, but this soon subsided.

Before the last divulsion he suffered from too frequent micturition, but ever since he urinates in a good stream, only four times in the twenty-four hours. No. 13 sound is now introduced once a week with facility, and the induration at the point of stricture is subsiding. See Case IX.

March 22d, 1870.—The sound is still passed, and, thus far, the stricture shows no tendency to recontract.

Group 4th.—Five cases, in which dilatation could not be tolerated, successfully treated by divulsion.

CASE XIII.—(July, 1867.) E. T., aged 28, had been under a six months' course of gradual dilatation for a stricture $5\frac{3}{8}$ inches from the external orifice, but the constriction remained extremely sensitive, and though it had been dilated to No. 12, showed a strong tendency to re-contract whenever the use of instruments was discontinued. On that account divulsion was performed with Sir Henry Thompson's "dilator." The external meatus, which had been dilated to No. 12, became painful, and was accordingly divided, and sounds to No. 15 were passed at intervals of three days, with scarcely any pain. The patient has remained well ever since.

CASE XIV.—(Oct., 1867.) D. McN., aged 30. Stricture of three years' standing; $4\frac{3}{4}$ inches down, dilatation to No. 12. Sensitive urethra. Divulsion with Thompson's instrument. Sounds to No. 15. Urethra tolerant. No relapse.

CASE XV.—(January, 1867.) Mr. ———, aged 40. Stricture, of long continuance, in bulbous portion. Dilatation insupportable, chills, etc. Divulsion with Thompson's instrument. Full-sized sound well borne. Good result.

CASE XVI.—(January, 1869.) James C., aged 51. Stricture, of twelve years' standing, $5\frac{3}{4}$ inches down. Several courses of dilatation. Relapse from neglect. Dysury. Failure of continuous dilatation. Divulsion (Thompson's instrument). No. 14 sound. Good result.

CASE XVII.—(December, 1869.) Thomas W., aged 50. Old stricture. Retention and extravasation of urine four and a half years ago. "Perineal section." Silver catheter retained five months. Extremely irritable and sensitive urethra. Dysury. Catheterism followed by rigors. Divulsion upon conductor (Thompson's instrument). Catheterism better tolerated. No more rigors. No. 12 every third day.

Group 5th.—Divulsion without conductor. The cases in this group were treated before I had made the modifications in Thompson's instrument.

CASE XVIII.—J. M., a gentleman of excellent constitution and good habits, aged 38, was brought to me by my friend Professor J. S. Davis, of the University of Virginia, on the 26th day of November, 1867.

The patient was suffering from dysury consequent upon a stricture of the urethra of ten years' standing. He had been for several days on the verge of retention of urine, but the trouble was kept at bay by rest, hip-baths, diluent drinks, opium, etc. I found him nervous, agitated, and in constant dread of complete retention. Urine had been dribbling from him for two or three days. He had made up his mind to undergo a cutting operation, if he could not be relieved otherwise. On exploration with bulbous bougies, a stricture was recognized in the region of the bulb, through which nothing would pass but a spiral whalebone bougie half a millimetre in diameter; over this a No. 4 tunnelled sound was introduced, and the canal farther enlarged to No. 6, then a gum catheter was introduced and retained for ten hours. On the following day divulsion was performed with Thompson's instrument. Hæmorrhage to about a drachm followed, and No. 12 sound was passed without difficulty. Every second day a larger sound was used, until No. 18 could easily reach the bladder. He left the city within two weeks after the operation, taking with him Nos. 16 and 17, which he has introduced once a week ever since. He now passes a full stream of urine at normal intervals, and enjoys excellent health.*

CASE XIX.—(February, 1868.) James H., narrow stricture, $5\frac{3}{4}$ inches down. Retention, relieved spontaneously. Dysury. Preliminary dilatation with tunnelled staff upon conductor. Divulsion at the same sitting, with Thompson's "dilator." Little hæmorrhage. No. 11 sound. Slight rigors on second and fourth day. Sounds to No. 13, continued once a week. Good result.

CASE XX.—(June, 1868.) Aug. M., aged 28, narrow stricture, of four years' duration, $5\frac{1}{4}$ inches down. Failure of dilatation. Dysury. Preliminary dilatation, then divulsion (Thompson's "dilator"). Hæmorrhage trifling. No. 14 once a week. Was out every day from date of operation.

CASE XXI.—(December, 1868.) Patrick H., aged 35. Stricture of several years' standing. Failure of dilatation. Divulsion. (Thompson's "dilator.") Hæmorrhage about a drachm. No. 12 once a week. Patient still under observation; has not used instrument for nearly a year. No relapse.

Divulsion should be Performed upon a Conductor when—

* June, 1872. Patient is now as well as ever, and uses his instrument periodically.

ever the stricture is very narrow, or there exist false passages. To effect this, I have a preference for the filiform whalebone bougies, because they can generally be passed with readiness where other conductors fail. When a tight stricture is detected, it is usually recommended to tie in a delicate gum catheter or bougie for twenty-four or forty-eight hours, in order to make way for the divulsor, but the introduction of such instruments is sometimes impracticable; the stricture is then considered impassable, and in the event of retention of urine the bladder is punctured, or else the external perineal division is done. I think that these extreme measures can frequently be avoided if the capillary guide and small conical tunnelled sounds are employed, as by this device sufficient dilatation can be made for the passage of a divulsor, and at the same sitting the bladder can be relieved and the stricture divulsed.

Group 6th, consisting of eleven cases, will show the results of the method just referred to, as applied to very close strictures. Preliminary dilatation was made, in every instance, with conical tunnelled sounds, and immediately after, divulsion to No. 18 was done by substituting the modified Thompson's "dilator" for the tunnelled sound, without removing the conductor.

CASE XXII.—(March, 1869.) Dr. —, aged 28, sought my advice for a stricture of long standing which had at times given him a great deal of trouble. He had been treated in England, and had afterwards, at irregular intervals, introduced sounds for himself, but the instruments had probably not entered the bladder, as his urethra was very sensitive and the stricture very narrow. The obstruction, seated in the region of the bulb, would not receive the smallest "bougie-à-boule." After a great deal of hesitation he submitted to the operation of divulsion, preliminary dilatation having been made with the tunnelled sounds. The hæmorrhage was moderate. Sounds were then passed to No. 14. At first, micturition caused some smarting, but no accident occurred, and he went away supplied with a sound of proper curve, which he promised to use once a week. He was heard from a few months afterwards, and was doing well.

CASE XXIII.—(April, 1869.) Charles V., aged 35. Supposed impassable stricture of seven years' standing, five inches down. Dysury. Very frequent micturition. Extremely sensitive urethra. Preliminary dilatation with tunnelled sounds upon conductor and divulsion at the same sitting. Hæmorrhage moderate. No. 14 sound once a week.

CASE XXIV.—(April, 1869.) Harvey E., aged 28. Very tight stricture $5\frac{1}{2}$ inches back. Retention of urine. Preliminary dilatation and divulsion at the same sitting. Slight hæmorrhage. Gum catheter retained twelve hours. No. 12 sound once a week.

CASE XXV.—(July, 1869.) F. F., aged 40. Narrow stricture of many years' standing. False passage. Urethra excessively sensitive. Catheterism very difficult. Preliminary dilatation, and divulsion. Hæmorrhage about two drachms. Sounds to No. 17. No. 10 on the next day, but no instruments could afterwards be passed, on account of increased sensitiveness of the canal. Abscess in perinæum. Urinary fistula.

CASE XXVI.—(June, 1869.) Matthew K., aged 52. Stricture of long standing, $3\frac{5}{8}$ inches back. Fistula in perinæo. Dysury, etc. Tunnelled sounds and divulsion at the same sitting. Sounds to No. 11. In the course of a month urine ceased to flow through the fistulous opening. Not heard from since.

CASE XXVII.—(July, 1869.) Albert M., aged 26. Stricture $5\frac{1}{2}$ inches down, with perineal fistula. Was treated by dilatation about a year and a half previously, but from neglect the difficulty has returned. Dysury becoming troublesome, he again applied for treatment. Tunnelled sounds, and divulsion. Sounds to No. 15, once a week.

CASE XXVIII.—(October, 1869.) John H., aged 46. Very narrow stricture of six years' standing, 6 inches down. Retention of urine. Cystitis. Hæmatury. Dysury. Very great frequency in micturition. Dribbling. Failure of ordinary catheterism. Tunnelled sounds. Divulsion. Slight hæmorrhage. No. 16 once a week. Micturition less frequent. Cystitis better for a few weeks, but recurred in the most violent form. Death three and a half months after the operation. Pyelitis (calculous?). No autopsy.

CASE XXIX.—(February, 1870.) J. McG., aged 36. Tight stricture, $6\frac{1}{2}$ inches down. Retention of urine. Failure of ordinary catheterism with fine bougies. Tunnelled sounds, and catheter. Three pints of urine drawn off. Divulsion to No. 18. Hæmorrhage moderate. Chill on following day, but no further trouble. No. 14 sound once a week.

CASE XXX.—(February, 1870.) J. S., aged 53. Stricture $4\frac{7}{8}$ inches down, supposed to be impassable, of fourteen years' standing. Dysury. Micturition every half hour. Failure of many attempts at catheterism, tunnelled sounds with conductor. Divulsion. No. 10 sound once a week. Micturition five times in the twenty-four hours in a good stream.

CASE XXXI.—(March, 1870.) Joseph C., aged 43. Stricture of nine years' standing, 5 inches down, supposed to be impassable. Dysury. Micturition every fifteen minutes. At times dribbling. Catheterism followed by rigors. Whalebone conductor. Tunnelled sounds. Divulsion. Hæmorrhage one drachm. Sound No. 14. Rigor on the following day, but no accidents. Micturition six times in the twenty-four hours.

CASE OF TRAUMATIC STRICTURE WITH FISTULA.

CASE XXXII.—(April, 1869.) George H., aged 28. Fracture of the pubes with laceration of the urethra. Retention in three days relieved by the catheter. Urine bloody for a week. Several retentions and finally abscess in upper part of thigh and urinary fistula. Dysury. Micturition every fifteen minutes. Failure of catheterism. One year after the injury, stricture at bulbo-membranous junction, which would only admit No. $\frac{1}{8}$. Tunnelled sound No. 3, then the modified two-bladed divulsor. Gum catheter retained for twelve hours. Sounds to No. 13, once a week. In five weeks fistula healed. Micturition normal.

It will be observed that, among the thirty-two cases treated, there were twenty-six successful results, one failure, and five deaths. Of the five deaths, two occurred at the end of three and a half months, and were not attributable to the operation (Cases V. and XXVIII.); one patient died of suppression of urine, with which he was affected before the operation (Case IV.); one died eight hours after divulsion, but would not probably have lived any longer had he been let alone (Case II.); and one death only (Case III.) was hastened by the operation, pyæmia having ensued.

I have since performed divulsion in fifty-two additional cases,

among which were several complicated with urinary fistulæ, with only one fatal result. The operation was done with conical instruments, beginning with small tunnelled sounds with capillary conductors in twenty-six cases, while in the remainder the tunnelled divulsor with conductor was used.

I believe divulsion possesses great advantages over cutting operations in properly selected cases, and that it will be often resorted to where internal and external division have heretofore been employed ; but it can never entirely supplant these and other methods, though it will probably continue to occupy a very prominent and important position among the surgical therapeutics of stricture of the urethra.

CHAPTER V.

INTERNAL URETHROTOMY.

IF dilatation or divulsion be impracticable the surgeon is sometimes obliged to use the knife, that the normal calibre of the urethra may at once be restored, and that the way may be prepared for the passage of full-sized sounds, which is the most certain mode of maintaining the calibre of the canal. The operative procedures usually employed consist of dividing the stricture from within or from without. The one is known as *internal*, the other as *external urethrotomy*.

The former only will now be considered. It is done by introducing into the urethra a knife (*urethrotome*), with which the strictured part is incised, together with a little uncontracted tissue in front and behind. The design is to obtain union by granulation, and with the aid of dilating instruments to insure the formation of a wide *cicatricial splice*.

The ancients, imagining that impediment to the flow of urine was generally due to what they called "carcinomas," "excrescences," resorted to "escharotics," and sometimes to catheters with sharp eyes, or other cutting appliances at their points (Ambroise Paré).

In the latter end of the past century, Dr. Physick, of Philadelphia, employed the "lanceted stilette," and similar instruments were afterwards used by McGhie (1823), and by Stafford (1827). By means of the "lanceted stilette" the stricture was supposed to be punctured, but there was no certainty in that regard, as the point of the instrument was apt to deviate from the proper route,

and make a false passage. This hazardous method prevailed for some time, but finally had to be abandoned.

In 1823 Mr. Civiale employed the "urethrotome," or "bistouri caché," to divide strictures in the fossa navicularis, and also to enlarge the meatus urinarius when too narrow to admit his lithotrite. Ashmead, and also Horner, had performed urethrotomy in the fossa navicularis as early as Civiale, if not earlier.

In 1825 Amussat devised a urethrotome for the division of strictures in the deeper part of the urethral canal. His incisions amounted to little more than scarifications. He subsequently introduced two other instruments, the value of which was questionable, and they were never brought into general use.

In 1827 Dr. Jameson, of Baltimore, published in the *American Medical Recorder*, vol. xii., page 329, some "practical observations on stricture of the urethra," with a case treated by internal incision, and described a urethrotome of his own, with a plate of the instrument, a sketch of which is here given* (Fig. 28). The following is substantially the description given by Dr. Jameson:

a. A small steel sound, deeply grooved on its convex surface, about one-third longer than a common sound, to admit of the necessary movement of the sliding knife.

b. A silver tube of the same curve as the sound,



FIG. 28. Dr. Jameson's Urethrotome.

* I am indebted to my friend Dr. John G. Curtis, Demonstrator of Anatomy, College of Physicians and Surgeons, New York, for a number of the drawings from which the wood engravings represented here were made.

about eight inches in length, having a guard at its vesical end to cover the knife.

c. The blade protruded.

d. Knob near the end of the staff, to protrude the blade.

This urethrotome, designed for cutting from before backward, does not differ very materially from some of the modern instruments. The small conducting steel sound was first passed through the stricture, and then the guarded blade introduced down to the obstruction, and the knife pushed onward.

In 1833 M. Reybard published, at Lyons, an essay on a "new procedure of curing strictures by incision," with an instrument having a short conducting gum bougie at its end, for cutting from before backward. This instrument was no great improvement over the lanceted stilette.

Maisonneuve's urethrotome, similar in its construction to that of Dr. Jameson, is the one now mostly in vogue (Fig. 29). It consists of a No. 1 deeply grooved curved sound (*B*), about twelve inches in length, with a small ring near its distal extremity, as handle,—to its vesical end is screwed a fine gum conducting bougie of ordinary length (*C*),—and of a triangular blade (*A*), attached to a stem somewhat longer than the sound. From the base of the blade, near its point, project two lateral wings, which serve to retain it in the groove of the sound. The summit of the cutting edge is blunted, to prevent injury to the normal mucous membrane. After many experiments with this instrument upon the cadaver and on the living, it was found that the healthy urethral mucous membrane did not usually escape injury. On this account Voillemier made a modification of it (Fig. 30), which he presented to the "Société de Chirurgie" of Paris in 1862. In the modified instrument, the blade is guarded by a plate of the same size and shape, and the summit is sharp, and not blunted as in the original.

The steps of the operation according to Maisonneuve are as follows:—

First, The conducting bougie is introduced past the stricture ; this is no easy matter, for it is made of very soft material, that it may coil up in the bladder.

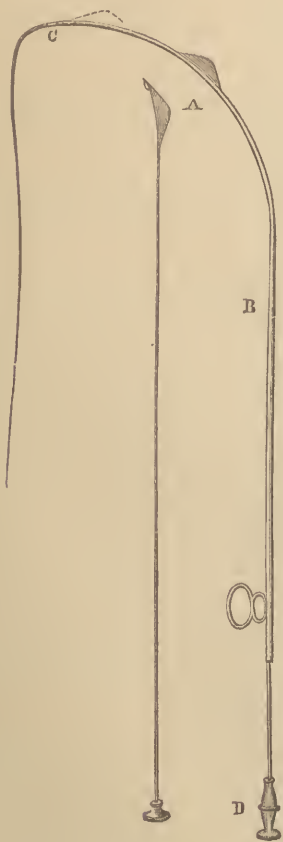


FIG. 29.
Maisonneuve's Urethrotome.

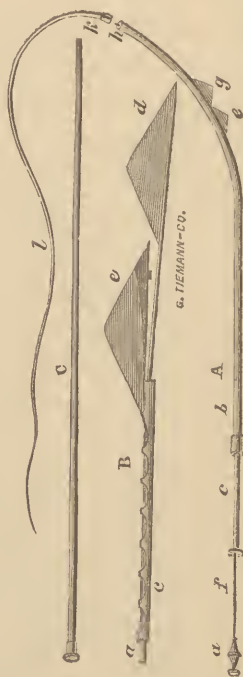


FIG. 30.
Voillemier's Urethrotome.

Secondly, The vesical end of the sound is screwed to it, and the instrument is slowly and gently pushed onward until it has

gone beyond the obstruction, and can be moved back and forth without impediment.

Thirdly, The blade is made to glide into the groove of the sound until it has reached the part to be divided; the penis is then drawn forward, the sound steadied, and the cutting blade pushed onward.

Fourthly, The instrument is slowly and cautiously withdrawn, and the operation is thus terminated.

The operative procedure with Voillemier's instrument (Fig. 30), differs but slightly from the foregoing.

Among other urethrotomes used by American surgeons, to cut from before backwards, are those of Drs. Gross, Pancoast, Mastin, and Westmoreland.

In 1849,* Civiale published an account of his instrument for retrograde urethrotomy (Fig. 31). The size of the flattened olivary extremity is such that considerable preliminary dilatation is necessary before it can be carried beyond the constriction. Sometimes, however, he used another instrument for scarifying from before backward to prepare the way for the retrograde urethrotome. The terminal olivary expansion is used as an explorer, and serves also to guard the blade, which can be opened to the degree required. He does not claim any originality for these instruments, but thinks he has been happy in the combination of the elements of those which had before been in use, with the result of obtaining great precision in their action.

The "urethrotome à bascule" or "bistouri caché," made longer, and with a short cutting edge, I think answers a better purpose than the long instrument, for strictures of the pendulous portion. (Fig. 32, natural size, is copied from a drawing in his "Traité des maladies des organes génito-urinaires," 1858.)

* De l'urétrotomie, ou de quelques procédés peu usités de traiter les rétrécissements de l'urètre.



FIG. 31.
Civiale's Urethrotome.



FIG. 32.
Civiale's Bistouri-caché.



FIG. 33.
Charrière's Urethrotome.



FIG. 34.
Trélat's Urethrotome.

Le Roy d'Etiolles' urethrotome for cutting from behind forward is little more than a scarificator.

Reybard, in his treatise on stricture, 1853, represents engravings of two urethrotomes for the retrograde operation,—one to dilate (*uréthrotome dilatateur*), and at the same time to make very deep and long incisions. He contended that the incisions, to prove serviceable, should extend through the entire thickness of the spongy substance, and even into the subcutaneous connective tissue. An eye-witness to one of M. Reybard's deep internal incisions informed me that he had seen the blade protrude through the skin. Occasional excessive hemorrhage, abscess, and also infiltration of urine, have been known to follow this mode of operation. His predecessors were at one extreme with their scarifications, and he has gone to the other with his long and very deep incisions. Scarifications are of no use; deep incisions are dangerous. Let us take the middle course, and make incisions free enough to reach the trouble. When the disease invades the whole thickness of the spongy tissue, with much induration, the internal division, immediately followed by free *divulsion*, is certainly preferable to these very deep incisions.

Ricord, Trélat (Fig. 34), and others have devised ingenious instruments to incise strictures from before backward and from behind forward in one sitting, but perhaps the best is Charrière's (Fig. 33), which is a modification of Civiale's urethrotome. It is now used with Maisonneuve's gum conductor. The instrument is carried down to the stricture, the concealed blade is pushed forward so as to incise the constriction, and then, by a mechanism similar to Civiale's, it is tilted up and the stricture is more freely divided in withdrawing the instrument a little. I have suggested the tunnelling of the point of this instrument, and the substitution of the whalebone guide for Maisonneuve's gum conductor.

Internal Urethrotomy is done in the Fixed or Pubic Curve as well as in the pendulous portion of the urethra. In France and in our country many prefer it to the other methods (in the pubic curve), while in Great Britain divulsion is almost exclusively used. My own preference is now for divulsion, and I only resort to internal urethrotomy in intractable strictures of the ante-scrotal portion of the canal. Success in this operation depends more upon the skill of the surgeon than upon the instrument he uses. A clean longitudinal incision should be made in the middle line of the urethral floor; sometimes a second one is done into the upper wall. Maisonneuve occasionally practises two lateral incisions.

The following are fifteen examples of urethrotomy in the sub-pubic curve and in the pendulous portion, from before backward and from behind forward, with different instruments.

CASE I.—(*November, 1865.*) James O'D., aged 41. Seven or eight gonorrhœas; first attack in 1846, last in 1861. Retention of urine four times in three years. First symptoms of stricture eleven years ago. Had never been treated until he came to me, when it was impossible to pass even No. 1 through an obstruction three inches from the external orifice. At that time micturition was exceedingly painful, and the urine flowed guttatum. For two weeks repeated attempts at dilatation failed, and retention of urine was feared. Desormeaux's endoscope revealed a glistening, nacreous surface at the seat of stricture, through which a probe only could be passed. I then concluded to perform internal urethrotomy so soon as I could pass a conductor, and asked him to return in two or three days, but when he called he was suffering from retention of urine of twelve hours' duration. I endeavored to introduce Maisonneuve's conducting bougie, but failed. The urgency of the case was such that I could not postpone the operation to procure other instruments; I coated with wax the milled end of Maisonneuve's steel director, and succeeded in getting it through the obstruction; then introduced the blade and made a free incision of the stricture, but no urine flowed. Another tight constriction six inches from the meatus was discovered and dealt

with as the first, but with much more difficulty. A full stream of urine gushed out, before I had time to pass a catheter, till one pint and a half had escaped. Hæmorrhage moderate. Conical steel sounds Nos. 11, 12, 13, and 14 introduced successively. No anæsthetic. No catheter retained. In two days he called at my house, and I passed Nos. 15 and 16. No. 17 every second day for a month, then twice a week. No rigors. Not an untoward symptom. Catheterism subsequently carried to No. 18.

August 23d, 1866, he called to introduce before me No. 17 conical steel sound, which he had used regularly every Saturday since his dismissal.

July 31st, 1868, the patient came to say that, having neglected to use his instrument for three months, and finding some impediment to its introduction three days before, he had used force, which was followed by considerable hæmorrhage and frequent micturition (every half hour). He passed before me two ounces of bloody urine, with some straining and pain, but in a pretty full stream. No. 8 bulbous bougie entered a false passage in the sinus of the bulb, and when withdrawn half an ounce of blood flowed. Rest for two days, a diluent drink, and warm hip-bath, had the desired effect. On August 3d he was much better, no chill or fever. Sounds to No. 17 without impediment. He confessed that he had attempted catheterism while under the influence of strong drink. Has remained well ever since. Catheterism once a month. He returned in January, 1870; no difficulty was experienced in passing No. 17.

He is now, June, 1872, in good condition, and the trouble has not recurred.—Nos. 16 and 17 can be passed.

CASE II.—Richard O., aged 42, of intemperate habits. This man was treated by me for urethritis in 1853. He has had in all seven gonorrhœas, the first in 1848, the last in 1861. In 1859 he was under my care for a tight stricture, which was dilated to No. 10; then I lost sight of him until March, 1866, when he came to say that he had neglected the use of instruments, and that he was suffering from dysury. Urine was constantly dribbling from him, and complete retention was impending. No. 1 gum bougie gave him relief, and he was kept in bed for a few days to be prepared for urethrotomy. Incidentally I ascertained that six years before, while climbing up a ladder, he had fallen astride one of the rounds, and that he had bled freely from the urethra for twenty-four hours, but had no retention of urine. On the 10th of March, 1866, I explored his urethra and found a linear contraction half

an inch from the external orifice, and another, very narrow, three inches back. The first was freely incised, and also the second with Maisonneuve's urethrotome, cutting along the upper wall. I had found it impracticable to use the gum conductor, and after some delay and trouble inserted the grooved sound. A No. 12 conical steel sound was passed, and met another obstruction at the bulbo-membranous junction. The director (No. 1) was introduced as before, with difficulty, and without the gum conductor; then the blade was slid into the groove and passed down the urethra to divide the stricture,—this time along the floor of the urethra. Hæmorrhage trifling. Sounds to No. 16. No catheter retained. He was sent to bed and catheterism ordered at intervals of a few hours for the first day, but he made water before this could be done. No chill or other unfavorable symptom. Once a day No. 16 was passed, and he was dismissed within two weeks. He afterwards returned twice a week, until early in May, to have the instrument introduced. June 1st, 1866, he was doing well and passing a good stream. Nos. 15 and 16.—July 24th, 1866. Had been absent six weeks, and no instrument had since been used. No. 15 passed without impediment. The patient was last seen a year after the operation, and catheterism with No. 15 was done without trouble.

Internal Urethrotomy from Before Backward.—The difficulties which I had experienced in the two cases just related, suggested to me a device by which they might in future be obviated. The first and really difficult step of Maisonneuve's operation is to pass the gum conductor. I have seen the attempt made by skilful surgeons, without success; and have often witnessed bending of the bougie in front of the obstruction, so that its point would appear at the external orifice. My success with capillary whalebone bougies induced me to employ them as conductors in urethrotomy, and I had but to adapt Maisonneuve's blade to the vesical end of my smallest-tunnelled sound, and I had a urethrotome of the simplest construction for cutting from before backward. The blade being sharp, both in front and behind the blunted summit; could also be used to cut from behind forward. It was not deemed necessary to give it as

much curve as that of the tunnelled sound. Fig. 35 represents one of these instruments, which is nearly straight, and I have experienced no trouble in using it, either in the sub-pubic curve, or in the pendulous portion of the urethra.



FIG. 25.
The author's
tunnelled ureth-
rotome.

The operative procedure is as follows: First, the capillary whalebone conductor is passed into the bladder.—Secondly, its distal end is slipped through the smallest tunnelled sound, and a little dilatation is made to facilitate the entrance of the point of the urethrotome, and the sound is withdrawn.—Thirdly, the tunnelled urethrotome is introduced in a similar manner as is the tunnelled sound. The penis is steadied with the left fore-finger and thumb, and the stricture divided by sliding the instrument gently upon the conductor until all resistance to its passage ceases.—Fourthly, the instrument is withdrawn, but the conductor left in position, that a large tunnelled catheter may be introduced, in order to ascertain if the incision has been sufficiently free, and at the same time to draw off the urine. Its practical application can be better illustrated by the citation of cases, which will also teach other points of importance.

CASE III.—John G., aged 53, entered Bellevue Hospital, March 7, 1866. Gonorrhœa ten years previously. Narrow stricture in the region of the bulb. Dysury. Frequent micturition. Retention relieved spontaneously. Dilatation persistently tried without success. On May 5th, 1866, after exploration, I injected half an ounce of oil into the urethra, passed a capillary whalebone bougie, introduced the tunnelled urethrotome (Fig. 35), and divided the stricture freely. No anæsthetic. No catheter retained. Sound No. 18. Hæmorrhage very moderate. Hip-bath, rest, diluents, quinine, and iron. Slight febrile reaction on the following day, none afterwards. Catheterism every second day.

Patient discharged on the 20th of May, and advised to continue the use of his sound. Has not since been seen.

CASE IV.—Owen W., aged 33, admitted to Bellevue Hospital, February 19th, 1866. Gonorrhœa six years previously. Three retentions of urine. The first, one year and a half after the urethritis. Great suffering from dysury, stream extremely small and twisted. Catheterism with small gum and other bougies had failed after numerous attempts. I first saw the man on May 12th, 1866, and, after a great deal of difficulty, succeeded in passing a capillary bougie through the stricture, which was situated in the sub-pubic curve. On the 14th I incised it freely with my urethrotome (Fig. 35), and passed No. 18 conical sound. No anæsthetic. Hæmorrhage half an ounce. No catheter retained. Urine drawn off for the first forty-eight hours. Hip-bath, diluent, etc. No chill or fever. He made a full stream of urine at normal intervals. Sound every second day. In a week the patient left the Hospital, and has not since been heard from.

CASE V. (Scamen's Retreat, June 10th, 1866.)—Louis G. G., aged 47. Urethritis at the age of 17. First symptoms of stricture (in 1857) twenty-one years after. In 1859 he had a swelling of the perinæum, and was operated upon by Mr. Michon, in Paris, but the patient could give no information regarding the operation. Whether this abscess was simply opened, or urethrotomy performed, I could not ascertain. He applied for admission at the "Retreat," on account of dysury and frequency of micturition (every hour). Catheterism had been repeatedly attempted without success, and was always followed by chills. Dr. T. C. Moffat, surgeon in charge of the hospital, requested me to examine the patient and to do what I thought necessary. Bulbous bougie No. 10 revealed a constriction $\frac{1}{4}$ of an inch from the external orifice, another $2\frac{1}{2}$, and a third 6 inches back, which proved to be extremely narrow. A capillary whalebone bougie was introduced into the bladder, and sufficient dilatation made with a tunnelled sound to admit my urethrotome, with which the strictures were incised deeply enough to admit No. 14 sound. Hæmorrhage one ounce. No anæsthetic. No catheter retained. Urine drawn off. Chill in four hours, but none subsequently. Sound every second day. After the operation he was able to retain his urine three hours, and to pass a full stream. In a week Nos. 14 and 15. Slight hæmorrhage. I saw him, from time to time, until November, when he left the hospital. I then lost sight of him, but he reappeared, April 17, 1867, when he complained again of dysury. He

had neglected the use of his instrument. No. 7 could not enter the deep stricture. Capillary bougie, tunnelled sound to No. 7, and afterwards dilatation to No. 12, when he was again in a condition to pursue his occupation. He remained under observation for several months, and finally went home to France.

CASE VI.—Lawrence S., aged 28, was admitted to Bellevue Hospital, July 18, 1866. Two gonorrhœas, ten and four years ago. First trouble in micturition (dribbling) in 1864. Several retentions. Dysury. Stream thread-like, calls extremely frequent. Catheterism very difficult. The House Surgeon succeeded, after many attempts, in passing a gum bougie No. $\frac{1}{2}$, but when he wished to withdraw the instrument found it firmly held, about three inches back, and was obliged to make forcible traction to remove it; considerable bleeding ensued. The bougie was tied in a knot (Fig. 36), and the violence used to pull it out produced a



FIG. 36.

laceration of the urethra at the seat of disease. Further attempts at dilatation proved useless. On August 4th, 1866, I introduced a capillary conductor, slid over it my urethrotome (Fig. 35), and divided the stricture from before backward, and afterwards discovered another constriction in the region of the bulb, which I also incised. The meatus urinarius was narrowed, and had to be divided. Very little hæmorrhage ensued. No anæsthetic. No. 9 sound. Scalding in micturition. On the following day some swelling appeared in the prepuce; it increased so rapidly as to interfere with catheterism. On the fourth day there was considerable hæmorrhage, besides a troublesome phimosis. After circumcision, the bleeding was found to have had its source in the frænum, which had been injured at the time the meatus was incised, and it was at once controlled by a pledget of lint. A gum catheter was introduced and retained 24 hours. In the excised prepuce there was a little abscess, caused by infiltration of urine through the connective tissue of the frænum. These complications prevented the passage of dilating instruments, and on the tenth day No. 5 was with difficulty introduced. The tendency to further contraction soon became manifest in the stricture of the pendulous portion. Accordingly on the 3d of November, 1866, it was freely divided from before backward, and from behind forward, with

the same instrument. Hæmorrhage slight. No anæsthetic. No catheter retained. No. 10 sound. Subsequently dilatation was carried to No. 13, and the patient was discharged January 20, 1867, after having been instructed to pass his instrument at intervals of a week. I saw him six months after his dismissal; he was still using his sound, and was passing a normal stream of urine.

CASE VII.—William H., aged 25, admitted to Bellevue Hospital, January 2d, 1867. Four gonorrhœas. During one of these attacks of urethritis he suffered much from chordee, and had the "chordee broken up" by a sharp blow with a book; free hæmorrhage ensued. Persistent gleet. Dysury. Several retentions. Failure of dilatation. Very narrow meatus. Stricture two and a half inches from the external meatus; another, very tight, five inches back. On April 7th, 1867, free division of meatus with Civiale's "bistouri-caché." Internal division of the two strictures with the tunnelled urethrotome. Hæmorrhage inconsiderable. No. 14 conical sound. In a few hours he urinated, contrary to directions, without the aid of a catheter. No chill or fever. April 29th, No. 15 sound. Stream of urine normal. He remained under observation for several months, and was taught to pass a sound for himself.

CASE VIII.—John P., aged 52, admitted to Bellevue Hospital, Jan. 3d, 1867. Three gonorrhœas; the first at the age of sixteen. Persistent gleet. Stricture of twenty years' standing, four and a quarter inches back. Contusion of perinæum, not followed by urethral hæmorrhage, a year before admission. Dysury. Very small stream of urine. Great frequency of micturition. Hæmorrhoids. Dilatation to No. 8 in 1861. Neglect. Dysury in 1863. No treatment since. When brought to the Hospital in January, 1867, he had complete retention. Catheterism with the smallest bougies failed, but after a hot bath he passed about a pint of urine in an interrupted, thread-like stream, in the course of an hour. On the following day the House Surgeon succeeded in introducing a gum bougie No. $\frac{1}{4}$ and in gradually effecting dilatation till a catheter could be passed, when five pints of urine escaped, and shortly after three more pints. This sudden evacuation of such a large amount of water caused a severe attack of cystitis. Dilatation was persevered in, but up to March 24th nothing larger than No. 4 gum bougie could be introduced. April 13th, internal division with the tunnelled urethrotome. Slight hæmorrhage. External orifice incised. Sounds to No. 16. No catheter retained. Urine drawn off

for two days. On the third day slight febrile movement. Sound every second day. In a week small abscess in the scrotal walls. Three or four days after, another collection of pus in upper and inner part of left thigh. "Phlegmasia alba dolens" of the leg and thigh. The whole limb was enormously swollen, and presented the characteristics of what is called milk-leg in lying-in women. The enlargement gradually but slowly subsided, and he left the Hospital, July 15th, 1867. No. 15. Oct. 9th, 1867, general health much improved. He had introduced No. 15 once a week since his dismissal. He called my attention to a number of varicose veins in the hypogastric region, which appeared soon after the swelling of the leg had subsided; some of these veins had increased to the size of the little finger. I could trace them from the left to the right groin. Pressure of the common trunk, in the right groin, to which they all converged, increased their volume by about one-third. It became evident to me that there was obstruction of the left iliac vein by a thrombus; this was the explanation of the "phlegmasia dolens." In October, 1869, I exhibited the patient to a class of students, and gave this explanation of his condition. His stricture had given him no trouble, he was passing his instrument once a week, but he suffered much at times from his cystitis. This patient was last heard from in May, 1872, when he was still passing his sound at regular intervals. His cystitis was then much better.

CASE IX.—Bellevue Hospital, April 22, 1857. Charles W., aged 26; narrow stricture of two years' standing, six and a half inches from the external orifice. Failure of dilatation. Dysury. Internal division with the tunnelled urethrotome. Hæmorrhage two ounces. Sounds to No. 16. No catheter retained. Urine drawn off for two days. No rigor. Patient up on the sixth day. Was seen six months subsequently, when he could pass a normal stream of urine. Sound once a week.

CASE X.—(May, 1866.) James M., aged 22, first and only gonorrhœa in January, 1865. Constant dribbling from overflow two months after, which compelled him to wear a urinal to keep his garments dry. The dribbling of urine continued up to the time of his applying to me for relief. Stricture two inches and a quarter from the external orifice, which admitted only a capillary bougie. Gradual dilatation to No. 6. Urethra very sensitive. Rigors. No further progress. June 12th, endoscopic urethrotomy (according to Desormeaux). Incision insufficient. Deeper incision, with the tunnelled urethrotome (Fig. 35).

Hæmorrhage about half an ounce. No. 12 steel sound. No catheter retained. No chill or fever. June 16th, micturition every two hours, in a full stream. No disturbance at night. November 11th, 1868, the patient introduced before me No. 15 conical sound, without difficulty. He is now in the enjoyment of good health, and continues to pass his sound every two or three weeks. Was last seen in March, 1872; was still passing his sound periodically, and was in excellent health.

My experience has led me to consider urethrotomy from before backward as a safe and proper operation, when skilfully performed, with the aid of a conductor, especially in narrow constrictions of the pendulous portion of the urethra. In strictures of the sub-pubic curve I would now do divulsion or the external division in preference.

The same objections made to Maisonneuve's urethrotome have been urged against mine. I have therefore followed Mr. Voillemier's example, and placed a guard on one side of the blade (Fig. 37).

The present tunnelled urethrotome is straight, and designed for operations in the pendulous portion of the urethra.

Internal Urethrotomy from Behind Forward.—I shall now give some instances of retrograde urethrotomy in the ante-scrotal portion.

CASE XI.—(Bellevue Hospital, 1860.) F. B., aged 47. Impassable stricture, from gonorrhœa, three and a half inches from the external orifice. Dribbling from overflow. Abscess at the root of penis (right side). Impending retention of urine. External urethrotomy in the perineal region. A narrow stricture detected in the region of the bulb, and freely divided. The current of urine having been turned, the first stricture became permeable, and was gradually dilated to



FIG. 37.—
The author's
improved
tunnelled
urethrotome.

No. 8, but no further progress could be made. In three months this stricture was freely divided, from behind forward, with Civiale's urethrotome (Fig. 31), and sounds to No. 14 introduced. The patient went away at the end of a month, and was not seen by me until four years afterwards, when I explored his urethra, and found that the stricture had recontracted to a very considerable extent (from neglect). I advised him to submit to a course of dilatation, but he did not return. He was readmitted to Bellevue Hospital, and divulsion was finally done with a good result.

CASE XII.—(June, 1866.) Robert M., aged 36. Old stricture, with urinary fistula. External perineal urethrotomy. Internal urethrotomy (retrograde) with Civiale's "bistouri-caché," for a stricture one inch and a half from the external orifice. Slight hæmorrhage. No. 13. No catheter retained. Good result.

CASE XIII.—(June, 1866.) James W., aged 38. Dense stricture of two years' standing, one inch and a half from the external orifice. Retrograde urethrotomy, with Civiale's "bistouri-caché." No. 18 sound. Moderate hæmorrhage. No catheter retained. No rigors. Good result.

CASE XIV.—(February 28, 1868.) John D., aged 18. Three gonorrhœas. The first, two years before. Dysury and dribbling since three months from the first urethritis. Rigors every day. Meatus urinarius contracted, indurated, and very sensitive. Two narrow strictures, $2\frac{1}{2}$ and $5\frac{1}{2}$ inches back. Capillary bougie and tunnelled sounds Nos. 3 and 4. Gum catheter retained twenty-four hours. Sounds Nos. 7 and 8. The constrictor $3\frac{1}{2}$ inches back was very dense, and would yield no farther to dilatation. Rigors. Meatus incised. March 13th, retrograde division of the stricture of the pendulous portion with Civiale's urethrotome (Fig. 31). Hæmorrhage half an ounce. No anæsthetic. No catheter retained. No. 12 sound. Scalding in micturition, but no chill or fever. Good stream of urine. The deeper stricture gradually dilated. In two weeks he left town, and could then pass a No. 12 sound, which he was using once a week, six months after, when he was last heard from.

Details of a case of congenital stricture operated upon January 11th, 1870.

CASE XV.—Lewi H., aged 32. Temperate, married, one child. No venereal antecedents. Had congenital phimosis; the aperture in the foreskin was of the calibre of a "darning-needle." From infancy

micturition was difficult. He said that during urination he always had a sensation as if "a string had been tied around the penis, about three inches from the end." The stream was gradually diminishing in size, and he was compelled to strain much at times to pass urine drop by drop, but never had retention. For the last five years he had a gleet discharge. He once had slight hæmorrhage during micturition, and from that time he thought the constriction of the urethra was gradually extending farther back. In the fall of 1869 he was circumcised, and his condition somewhat improved, but his medical attendant discovering a narrow stricture at the meatus, sent him to the city for treatment. Penis normal. External orifice indurated; would admit only a small probe, which could be carried back three inches without impediment. After free incision of the meatus, bulbous bougie No. 2 arrested at $1\frac{1}{8}$ inch. No. $\frac{1}{2}$ showed a long constriction, which extended back to the peno-scrotal junction. A blunt-pointed, narrow, straight bistoury was introduced, and the canal incised, from the peno-scrotal junction to the external orifice; then Civiale's bistouri-caché was used to make a freer division. No. 10 to the peno-scrotal junction. No anæsthetic. Very little hæmorrhage. Quinine, etc. Gum catheter No. $5\frac{1}{2}$ retained twenty-four hours. I considered the incision, near the peno-scrotal junction, insufficient, inasmuch as the sound No. 10 would not go beyond that point; therefore, on the sixth day, I practised free divulsion, with the result of introducing No. 10 into the bladder. By an oversight, no quinine was given. Rigor. No fever. Slight hæmorrhage. No catheter retained. Good stream of urine three times a day. No. 10 every second day. He went home on January 28th, and his physician now passes the instrument twice a week.

It is scarcely necessary for me to speak again of the indications and contra-indications of this operation. The dangers have already, in an incidental way, been alluded to, and I shall now only name some of them in the order in which they usually occur. Hæmorrhage is apt to follow the very deep incisions, likewise infiltration of urine and abscess, but pyæmia may supervene upon the merest scarification.

I have been very fortunate in the fifteen operations recorded above, for, though a serious complication—thrombosis (Case

VIII.)—has occurred, I have no fatal result to report. Relapse

followed in some cases, but the cause was evident, and it need not generally be feared if catheterism is continued at intervals of from one to four weeks.

During the past two years I have performed four additional internal urethrotomies in the pendulous portion, all terminating favorably.

Professor Otis has lately called attention to a class of strictures of large calibre which often escape complete division or divulsion by ordinary instruments, and for the cure of which he has revived the method of internal urethrotomy, combined with dilatation, proposed by Reybard, with the exception that the incisions are not so deep and long as Reybard was in the habit of making them. To carry this plan of treatment into effect, Dr. Otis has invented the very ingenious dilating urethrotome described below. Fig. A.

“The instrument which I term the *dilating urethrotome* consists of a pair of steel shafts (A and B, Fig. A), connected together by short pivotal bars, on the plan of the ordinary parallel ruler, as shown in the expanded instrument at 2. Its expansion or contraction is effected by means of a screw

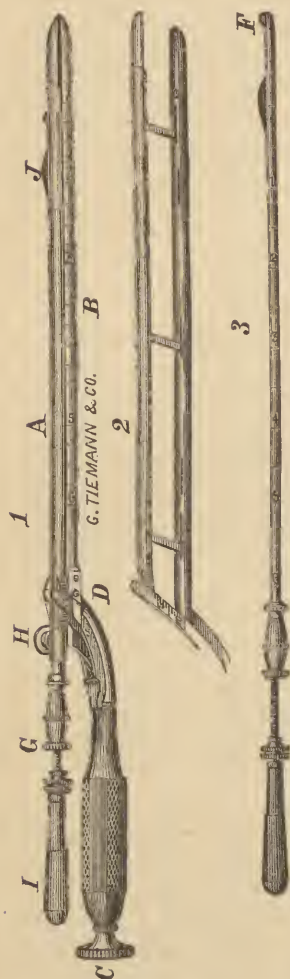


Fig. A.

1. Dilating urethrotome.
2. Dilated.
3. The urethrotome, which corresponds almost precisely with Dr. Peters's instrument.

which traverses the handle connected with the lower shaft, and

is moved by means of the finger-button (C). Attached to the distal end of the screw is a pair of short, curved, registering arms, seen at D, 1, which ride through grooves on either side of the shafts (A and B), and are marked, on one side, with the divisions and corresponding figures of the American scale, on the other, with those of the French in millimetres. Connected with the screw in the handle, the rise and decline of this register indicate exactly the degree of separation of the shafts, and consequently the precise progress of the dilatation of the instrument. Upon the inferior shaft (B) is engraved a scale of inches and quarter-inches, by which the depth of its introduction into the urethral canal may be noted. Up to this point the instrument is simply a *divulsor*, and may thus be used by introducing it into the urethra until its distal extremity is beyond the supposed point of stricture; the finger-button (C) is now turned, dilating the instrument, until, if considered desirable, the stricture is completely ruptured.

"The upper bar of the instrument, however, which is hollowed out, is traversed by a urethrotome (3),* the distal extremity of which terminates in a little metallic knob or indicator F, 3; by the metallic handle (G, 1) of the canula of the urethrotome, it is moved at will along through the entire length of the shaft (A) of the dilator; a small button-screw, II, secures the canula at any point. Running through the canula and attached to the handle, I, is the staff of the urethrotome, terminating in a thin narrow spring blade, which, when at the extremity of the canula, is concealed in the deep groove which extends on its superior aspect through its entire length. On withdrawing the handle of the urethrotome, I (its canula being fixed firmly at any given point by the button-screw, II), the spring blade (J, 1) rises out of the

* This form of urethrotome, with concealed spring blade, was invented by Dr. George A. Peters, of this city, and presented to the profession some years since

groove by means of a little elevation on its floor, rides over it, displaying the full width of the blade (from one to two lines) for half an inch, when it again drops down and is concealed in the groove of the canula.

“The instrument, with its contained urethrotome, having then been passed down beyond the supposed or known point of stricture, and dilated until the stricture is made tense, the button-screw, II, is turned, releasing the canula, which may then be drawn carefully outward until the knob or indicator, at its extremity, is arrested by the stricture. The canula is then advanced about half an inch and secured by a turn of the button-screw, II; a rapid movement of the handle, I, of the urethrotome, *outward*, brings its blade up through the stricture, from behind it forward, incising it almost instantaneously, and passing down again into its concealment. The finger-button at the extremity of the handle of the dilator is then turned, and the instrument is again dilated sufficiently to ascertain whether or not the stricture is completely divided: if not, the knife may be passed down, *from before backward*, completing the operation. Should other strictures present, the use of the indicator, while the urethra is kept tense, will reveal the exact locality of each, and the blade may be applied as required.

“The especial advantages claimed for this instrument are, that it first makes the urethra *tense*—thereby establishing the stricture as a fixed point; that it is capable of being adapted to strictures of any size within its compass; that it accurately defines their locality and extent; that it attacks a tense instead of a flaccid stricture, and hence, that its work is approached with confidence; that its incisions are made with ease, at a predetermined point, depth, and extent, instantaneously—and hence, with the slightest possible discomfort to the patient; and lastly, that it combines great strength with ease and simplicity of manipulation. Since

the completion of the instrument, now four weeks since, I have operated with it on six cases of stricture in the ante-bulbous portion of the urethra with complete success and satisfaction in every particular. Its compass is from 23 F. to 34 F., corresponding to 13 and 21 of the English scale. Messrs. Tiemann & Co. are confident of their ability to make one of similar pattern which shall range from 23 F. down to 18 F., corresponding to 13 and 9 of the English scale, and so curved that it may be applied to the deeper portions of the urethra; but it is for operation upon strictures of large calibre that this instrument has been constructed, and, except in such cases, especial superiority over others in use is not claimed. It will, however, I think, prove a valuable aid in completely restoring the natural calibre of urethras that have been imperfectly operated on by other instrumental means."*

Dr. Otis' instrument is excellent for strictures of large calibre (No. 12 or 13), and as I think the same principle should be applied to strictures that admit only No. 4, 5 or 6, I have had a small dilating urethrotome made with the same (Dr. Peters') cutting blade, but with two lateral dilating springs so arranged that only the constricted portion of the urethra is stretched. The point may be tunnelled and a capillary conductor used in cases of false routes. The annexed wood-engraving (Fig. B), representing the blade protruded and the dilating part opened, gives a suffi-



FIG. B. The author's dilating urethrotome.

* Remarks on Strictures of the Urethra of Extreme Calibre, etc., by F. N. Otis, M.D., etc., etc. *New York Medical Journal*, February, 1872.

cient idea of its construction, and it is too simple to merit further description.

The manner of using the instrument is briefly as follows:—

It is introduced closed into the urethra until the central portion of the dilating springs corresponds to the stricture to be stretched. The screw near the handle is turned until the springs are sufficiently expanded to make the strictured portion tense, then the blade is protruded and the stricture divided; further dilatation may be made, the blade pushed back—this time cutting from before backwards—and dilatation repeated perhaps a third time, when the stricture tissue is cut through completely.

The urethra is afterwards explored with a full-sized bulbous bougie, to be sure that there is no hindrance to the passage of a large sound.

The after-treatment is the same as in ordinary urethrotomy, namely, periodical catheterism with large instruments during, and for some months after, cicatrization.

Dr. Otis has operated upon a number of cases with his instrument, and he tells me that in several instances no subsequent catheterism was used, and that after many months the patients returned well and the trouble showed no tendency to recur.

CHAPTER VI.

STRICTURES AT THE MEATUS URINARIUS, AND IN THE FOSSA NAVICULARIS.—THEIR NATURE, DIAGNOSIS, AND TREATMENT.

THESE strictures are congenital, traumatic, chancreous, or gonorrhœal in their origin.

In the Congenital Variety there are sometimes two narrow external orifices; a lower one, through which the urine flows, and an upper, terminating in a cul-de-sac, at a distance varying from half an inch to three or even four inches. There may be, just within the meatus, a crescentic valvular fold, a thin diaphragmatic membrane, or else a mere narrowing of the outlet, which in that case is usually high upon the glans, just short of constituting epispadias. Or there may be slight hypospadias, with a very narrow transverse slit at the base of the glans (Fig. 40).

Congenital phimosis and narrowing of the meatus urinarius are often associated; when there is a very small preputial orifice, circumcision should be done without delay, that the constriction at the meatus may be treated. Case 15, Chap. V., is a good illustration of the coexistence of phimosis and congenital stricture.

These abnormalities belong properly to the category of malformations, but clinically they may be considered as strictures, for they present similar symptoms and sequelæ, and have to be subjected to the same treatment.

The Traumatic Variety sometimes results from frequent and rude catheterism, wherein the meatus is repeatedly contused. In a case of the kind, observed by one of my colleagues, the external orifice was red, narrowed, indurated, and presented the appear-

ance of malignant disease. The patient was an old man who had been in the habit of introducing a rough catheter several times a day, to relieve himself. As soon as he had learned to pass a properly constructed instrument, all the unpleasant symptoms disappeared. Generally, however, when these patients seek surgical aid, the tissues are found so altered as to demand more active interference. Another form of traumatism is amputation of the penis. This operation, when done in the usual way, is followed by a very narrow and troublesome constriction of the extremity of the urethra. I can remember several such cases treated in Bellevue Hospital, many years ago; one man in particular, who died from this cause after several years of the most intense suffering. The orifice would barely admit a small probe. The poor fellow spent most of his time in vain endeavors to relieve himself, and finally succumbed with cystitis, pyelitis, and disorganization of the kidneys. Such untoward results can be averted by cutting the cavernous about three-quarters of an inch shorter than the spongy body, and making three rectangular flaps of the latter and stitching them to the skin around the stump, so as to make a rudimentary glans penis. This method, with four flaps, was first recommended and practised by Ricord. The following is another very interesting example of traumatic stricture at the external orifice. About seven years ago, my friend, Professor Van Buren, invited me to examine one of his patients—an adult—who for a long time had been suffering from dysury. My attention was called to the extremity of the penis, which was abnormally flat, and to a narrow meatus. The patient had been circumcised in infancy; this had given a clue to the nature of the trouble, and the Doctor felt satisfied that a slice of the glans penis, including the meatus, had been cut at the time of the operation. The usual free division of the external orifice was made, with the most satisfactory result.

Those of Chancrous Origin invade not only the meatus, but often extend half an inch or even more in the fossa navicularis. In the autumn of 1869, a young gentleman consulted me for a chancroid of the meatus, which had extended three-quarters of an inch in the urethra. It healed shortly after, and left a deeply depressed elliptical cicatrix, with an orifice capable of receiving only a No. 2 bougie. In November, 1868, John M., aged 27, came to seek relief from troublesome dysury, solely dependent, as he thought, upon a phimosis, the consequence of chancre. He had had gonorrhœa ten years previously. Nothing larger than No. $\frac{1}{2}$ gum bougie could be passed. Circumcision was performed to facilitate the diagnosis. After having slit open the prepuce, I found that about three-fourths of the glans penis had sloughed, and the meatus contracted to No. $\frac{1}{2}$ bougie. It was freely divided above and below, the redundant prepuce was excised, and interrupted sutures applied. There were two strictures of gonorrhœal origin, $2\frac{5}{8}$ and $5\frac{1}{2}$ inches back; these were readily dilated to No. 16. Catheterism with No. 16 was continued one year. No recontraction.

On February 16th, 1870, I exhibited to the class of students a man who had been suffering from dysury and constant dribbling, due to a constriction of the meatus,—through which only a small probe could pass,—from a chancrous ulceration that had carried away nearly the whole glans penis. As soon as the stricture was divided these symptoms ceased, and when the wound had healed the passage was sufficiently free to receive No. 13 sound.

The Gonorrhœal Variety.—Stricture at either end of the fossa navicularis occurs much more frequently as a consequence of gonorrhœa than it does from the three causes before mentioned. It generally coexists with one or more constrictions in the deeper part of the canal. There may be narrowing of the orifice consecutive to inflammation of the whole glans, or to erosion of the

lips of the meatus. In the fossa navicularis, the contractions often follow ulceration of the mucous membrane; they therefore belong to the class of cicatricial strictures, and are extremely dense, sensitive, and intractable.

All the varieties of constrictions at the meatus or in the fossa navicularis may escape attention for years, until the occurrence of some accident which may necessitate catheterism, when they are discovered by the surgeon.

Sometimes a small calculus is arrested behind the contracted external orifice, remains there for months or years, and attains very considerable proportions without being recognized by the patient. An interesting case of this kind was related to me by Dr. J. S. Davis, Professor of Anatomy, etc., in the University of Virginia. I shall give a brief statement of it, extracted from a letter to Dr. Davis from the operator, Dr. J. B. Taylor:—On October 14th, 1864, Dr. Taylor received an urgent message to visit Mr. K., who was affected “with the gravel.” He found the patient—a tall, emaciated man, thirty years old—in great agony; his penis was much swollen; the “glans,” being as large as a man’s fist, was red and sodden from the dribbling of urine. He declared that he had felt no pain or known anything of his condition until the day before. His father, with whom he lived, knew nothing of it, except that he had had “the gravel” when a child. A calculus could be seen and felt through the meatus urinarius. Dr. Taylor applied lead water to the parts, and waited three days for the subsidence of inflammation; then slit the urethra, and with a pair of dressing forceps extracted the concretion, which was firmly embedded in the tissues. Much suffering followed the operation; on the next day the pain subsided, but the dribbling of urine continued. A silver catheter was then left in the urethra, and in a few days the wound healed. The Doctor carefully explored the urethra and bladder, but could

find no other calculi. Dr. Davis, who has the calculus, writes me that it is phosphatic, and measures $4\frac{7}{10}$ inches in circumference.

Pathological Effects.—If left to themselves these strictures will contract, and be followed by the same consequences as the deeper seated ones. Civiale, in his treatise on diseases of the genito-urinary organs, 1858, page 566, mentions three cases of narrow constrictions with urinary fistulæ, etc. In one there was rupture of the urethra, extravasation of urine behind the glans, and an abscess extending to the scrotum. In the second, rupture of the urethra had also occurred behind a stricture of the fossa navicularis, then extravasation of urine, abscess, and finally, several fistulous openings. The third case was a man 71 years old, whose meatus had been destroyed by a chancre: the glans was swollen, inflamed, and perforated by numerous small openings, which gave passage to the urine.

In October, 1868, I was called to a neighboring city, to see a man who had retention of urine. I found him moribund. Extravasation of urine had already taken place, the scrotum and perinæum being enormously swollen. At the external orifice there was a constriction, from chancre, through which but a small probe could be introduced. I divided the obstruction; there was another, anterior to the bulb, but I found no great difficulty in passing it with a No. 3 gum catheter. All this trouble had arisen from the stricture at the meatus, and the urethra had given way, under the pressure of the column of urine, at its weakest point, which was behind the deep-seated stricture.

Narrowing of the meatus is much more frequent than is generally supposed. An analysis, by Sir Henry Thompson, of 270 preparations, exhibiting 320 "distinct strictures," shows the proportion of constrictions near the outlet to be 17 per cent. of the entire number. In my own experience the proportion of strictures in

that region to the entire number I have seen is much greater ; it is at least 30 per cent.

Diagnosis.—There exists, in almost all of these cases, a localized chronic urethritis behind the stricture, which gives rise to some scalding in micturition and to a gleet discharge. There is also dysury, proportionate to the degree of constriction; these symptoms, together with some reflex irritation at the neck of the bladder, lead the patients to consult their surgeons. Sometimes there are no evidences of disease, or they are so slight as to cause no apprehension. The trouble often escapes observation, on account of the defective methods of exploration employed by the majority of surgeons, or from entire want of exploration. The narrowest of the constrictions are generally situated at the external orifice, and there is no difficulty in distinguishing them. But those which are out of sight should be carefully examined after the manner described in the chapter on diagnosis. When there is but a crescentic fold or a diaphragmatic membrane, a steel sound can readily be passed, no impediment is felt, and the surgeon dismisses the patient, saying there is nothing the matter. But the gleet continues, and the irritation at the vesical neck is still manifest. Therefore this mode of examination is of no value. The soft gun bulbous bougie is the best instrument for exploring the canal in its whole length, and it is wrong to attempt the treatment of urethral diseases without having a complete set.

Treatment.—In the case of a crescentic fold or a thin membrane near the external orifice, the first catheterism may be sufficient to destroy either; the stricture is thereby divulsed, and a large sound introduced a few more times will be sufficient to effect a cure. But when there is narrowing of the orifice, or a well-formed stricture in the fossa navicularis, more energetic treatment is required. Here dilatation is not only

unavailing, but gives intolerable pain, is followed by induration of the glans and greater subsequent contraction, and is sometimes attended with rigors and other constitutional symptoms. In its normal state, says Mr. Civiale, the meatus is the narrowest part of the urethra, and it is also the least extensible. It is not strange, then, that it should resist dilatation when diseased. Cauterization has been used with even worse results than dilatation. Divulsion is not to be thought of. Incision gives better results than any other known mode of treatment. This procedure was popularized by Mr. Civiale, who carried it out first, in 1824, to facilitate the passage of the lithotrite; and afterwards it became an established method of treating strictures in that portion of the urethra. The ancient lithotomists must, however, have employed it for the removal of calculi lodged in the fossa navicularis. Celsus gives directions how to make external urethral incisions for the removal of calculi embedded in the spongy portion, and in all probability found concretions in the fossa navicularis, and must have removed them by incision of the meatus. Some of the cotemporaries of Mr. Civiale seem at first to have made scarifications rather than incisions in strictures of the fossa navicularis and meatus, and used dilatation as after-treatment. They objected to Mr. Civiale's method because the uncontracted urethra, for a little distance behind the constriction, was divided; but Mr. Civiale claimed that this was necessary to insure success; and it now stands as a canon of urethral surgery, that not only the stricture, but from a quarter to half an inch of uncontracted tissue, in front and behind, should be included in the incision.

This Operation can neither be called internal nor external urethrotomy. It partakes of the characters of both, for generally the meatus is divided, even if the constriction is in the middle of the fossa navicularis. It is done from within, but a portion of the cut

is exposed to view. This, I think, is a sufficient reason why it should be treated of separately. It can be accomplished with a blunt or a sharp-pointed bistoury passed along the groove of a probe, or, as Mr. Civiale sometimes recommends, with a narrow, curved, sharp-pointed knife guarded by a small ball of wax, but he prefers to use the instrument (Fig. 38),—so familiar to all,—



FIG. 38.—Civiale's bistouri-caché.

which is similar to Frère Côme's "lithotome caché," reduced in size. I give, in nearly Mr. Civiale's words, the description of the operation. The patient may be placed standing, sitting, or recumbent. The operator seizes the penis with the thumb and index of the left hand; with the right he introduces the urethrotome to the depth required, viz., about one-third of an inch beyond the stricture, opens the blade, and by a rapid traction cuts the stricture along the floor of the canal. He does not think it good practice to make very free incisions, as he fears that a fenestra behind the glans may result, but thinks it is better to be content with a moderate incision, which may be repeated in a few days. After such a procedure, he says, the diseased tissues may become softer and less resisting than they were at first, and consequently the second incision can often be dispensed with. I do not agree with Mr. Civiale in this respect, and prefer to make at once a free incision—just short of hypospadias—so as not to be obliged to employ the knife a second time, for the patient is very likely to object to it, even though the pain be very slight. The free division, if judiciously practised, will not generally be followed by any untoward result, and besides, it allows for the little contraction which occurs after cicatrization.

When the external orifice is too narrow to admit the urethrotome, I first make an incision with a small, straight, probe-like, beaked bistoury.

Rarely more than one incision is necessary, and that usually along the floor of the urethra.

Mr. Civiale quotes Dr. Payan as having, on several occasions, made two lateral incisions, and as proposing to add a second blade to the urethrotome in order to make two incisions at once, as in bilateral lithotomy. This plan answers well in cases of hypospadias, where the single inferior incision is impracticable. I have had occasion to adopt this practice in one instance. A young gentleman who had been suffering from a persistent gleet was also affected with a congenital hypospadias which had been increased in extent by a chancroid. His medical attendant had introduced instruments to No. 8, but with no benefit. The edge of the abnormal orifice was very thin and inflamed, and there was, at about one-eighth of an inch within, a stricture which had become very irritable. An inferior incision would only have made matters worse, so I made free lateral cuts, first on one side, then on the other, with Civiale's bistouri-caché, and was able to pass No. 18. The case terminated in every way satisfactorily, and there was no recontraction five years after.



FIG. 39.

Figure 39 is a diagram illustrative of the operation, with a double instrument, for stricture behind the thin edge of an abnormal external orifice.

Another exceptional case—requiring an incision along the upper instead of the lower wall—came under my observation in September, 1869. There was hypospadias, the orifice being at the base of the glans (Fig. 40 *c*), and admitting No. 7½ bulbous bougie, and another opening somewhat smaller (*b*), which was the mouth of a canal one inch in depth, along the upper wall of

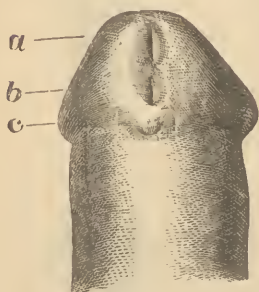


FIG. 40.

the urethra. There was a slit or depression (*a*) at the normal situation of the meatus. In this instance I passed a small bistoury, guided by a grooved probe, into the cul-de-sac and cut open the canal, so as to give it and the urethra a common outlet, and was able to pass No. 16 sound. The object of the operation was to facilitate the passage of large instruments to maintain

the patency of a stricture, in the perineal region, which had been treated by external incision.

I have employed the various instruments above indicated, but prefer the bistouri-caché. As beginners may find this instrument too expensive, I have asked Messrs. Tiemann & Co. to make a cheaper one, which will answer the same purpose. This urethrotome may commend itself by its simplicity. It is shaped like an ordinary pair of surgical scissors, but has only one outer, cutting edge, which is guarded by the other blunt blade when closed for introduction into the urethra. It is less than half the size of the bistouri-caché, and can be used with the same precision as Mr. Civiale's instrument.

A second instrument (Fig. 41), with the blade constructed on the same principle, has lately been made for me at Messrs. Shepard and Dudley. It is even less expensive than the scissors-like meatotome, and possesses all the advantages of Civiale's bistouri-caché,

is more easily cleaned, and can be made to enter constrictions at the external orifice impermeable to the "bistouri-caché."

The hæmorrhage which follows this operation is generally inconsiderable, even when a very deep incision has been made. In a few cases it has recurred obstinately after each catheterism, for a week or ten days, but could readily be arrested by moderate lateral compression from without.

The operation is done so quickly that the patient seldom complains of much pain.

In two cases only have I observed infiltration of urine (at the extremity of the prepuce),—Case I., Chap. IV.; Case VI., Chap. V. When the frænum extends to the lower commissure of the



FIG. 41. The author's meatotome.

lips of the meatus, the incision should be made a little to one side, or else the frænum divided from its attachment with a pair of scissors, and this trouble will surely be prevented.

The After-treatment is of the simplest kind. The retention of a catheter, long or short, should be avoided, though it has been recommended by high authorities. Professor Van Buren was in the habit of using a silver canula one-quarter of an inch in diameter, three inches in length, open at both ends, which was worn for forty-eight hours; but he was soon convinced of its uselessness, and gave it up several years ago.

Sir Henry Thompson advises the introduction of a plug of dry lint as large as a No. 12 instrument, this to be passed in one inch and replaced in a few hours by another, previously oiled. I found these plugs too irritating to be well borne, and discarded them

long since. The introduction of a large-sized sound every third or fourth day for five or six weeks is generally all that is required.

As patients are often obliged to go and attend to their avocations immediately after the operation, I use the device, described below, to prevent soiling of the garments. A very thin pledget of dry lint is introduced into the urethra as far as the cut extends, so as to prevent adhesion of the raw surfaces, and is retained by a strip of adhesive plaster one-third of an inch wide and about two and a half inches long, applied to the glans penis in the manner indicated (Figs. 42 and 43). The prepuce is then drawn forward

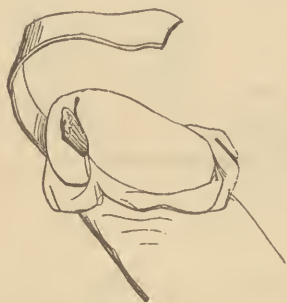


FIG. 42.



FIG. 43.

and makes an excellent covering for the dressings. In this manner sufficient lateral compression is made to prevent hæmorrhage, and as it covers only half of the meatus, micturition is not interfered with. If it gets wet and loose, the patient can replace it by a fresh piece. The lint is changed at the end of twenty-four hours, and no dressing is required after two days, when granulations begin to sprout. The first time the patient urinates he complains much of scalding, but this subsides as soon as the urine is rendered bland and unirritating by the free use of diluents.

The object of the operation, in cases where the stricture is not narrow and gives no trouble, is to facilitate the passage of instru-

ments for dilating deeper-seated constrictions. I have long been in the habit of dividing the meatus whenever a No. 12 could not be introduced without putting the parts upon a stretch and giving pain. The operation causes less suffering than a sound which over-distends the orifice. Of eighty-four cases of stricture, in the deeper part of the canal, which I treated by divulsion, forty-seven required incision of the meatus and *fossa navicularis*; of nineteen in which internal urethrotomy was done, incision of the meatus was necessary in sixteen; and of thirty-one demanding external perineal urethrotomy, fifteen needed division of the external orifice.

Ordinary dilatation, of deep-seated strictures of the urethra, can rarely be carried to the required degree without previous division of the meatus urinarius. Civiale has employed it more frequently than any one else; from 1824 to 1858 he had performed nearly three thousand operations with the best results.

CHAPTER VII.

EXTERNAL PERINEAL URETHROTOMY.

BEFORE examining the merits of the different modern modes of incision of the urethra from without inward, *in perinæo*, as applied to the treatment of obstinate stricture, it is worth while to cast a glance at the early history of the operation. But first a word as to its name. It has been known under the various titles of puncture of the perinæum, the *boutonnière*, perineal section, external urethrotomy, perineal urethrotomy. None of these terms, however, seems to convey to the mind exactly what is done. Nothing definite is implied by the first three, and only those who are very familiar with the subject can comprehend what is meant. In the case of the last two there is also some obscurity, for external urethrotomy signifies dividing from without any portion of the canal, and by perineal urethrotomy may be meant *internal* incision in the perineal region. As the operation consists in cutting the urethra from without inward in the perineal portion, the best name for it is, I think, *external perineal urethrotomy*.

The failure of catheterism, in obstruction of the urethra, has often induced surgeons, even in very remote times, to resort to cutting operations in the perinæum for the relief of the over-distended bladder. Celsus, as already quoted, gives directions for the performance of external urethrotomy, in the spongy portion of the canal, for the removal of calculi impacted in the urethra.

Rhazes, at the beginning of the tenth, and Avicenna in the

eleventh century, are mentioned as speaking of an incision in the urethra through the perinæum, for the relief of retention of urine. Avicenna is thus quoted by various authors:—"There are some who have taken another route; they have made a small incision between the anus and the testicles, into which a canula was introduced to give issue to the urine." This, according to Avicenna, was a common mode of relief in his time.

External perineal urethrotomy, the offspring of lithotomy, was usually performed for the relief of retention of urine caused by the impaction of calculi in the urethra. It was not, however, reduced to a system until the early part of the sixteenth century (1525), when Giovanni di Romani of Cremona, and his disciple Mariano Santo, had introduced and popularized the method of lithotomy known as the *apparatus major*, of which external perineal urethrotomy is a step. An incision was made in the median line of the perinæum, or a little to one side of it, from the base of the scrotum to within half an inch of the anus, and the urethra opened.

In the middle of the sixteenth century Ambroise Paré recognized that obstruction to the flow of urine sometimes occurred as a consequence of gonorrhœa, from the formation of "carcinomas" in the urethra, for the "cure" of which he recommended compression and sometimes excision of the "carcinomas" by means of a fenestrated canula, and a catheter which he described and figured in Book 16, chapter xxvii. of his works. Paré's operation of cutting or tearing the "carcinomas" was a species of *internal* urethrotomy. I can find no mention in his works of cutting open the urethra from the perinæum to relieve retention of urine, for which, in case of failure of catheterism, he relied entirely upon fomentations, etc.

Thence not a word on the subject until the middle of the seventeenth century. The first well-authenticated case of external

perineal urethrotomy for the cure of stricture, and not merely for the relief of retention of urine, is recorded by Richard Wiseman, Surgeon to King Charles II., in his "Chirurgical Treatises," Eighth Book, "The ill consequences of gonorrhœa." He relates that in 1652 he assisted Mr. Ed. Molins in performing an operation upon "an old fornicator, who had long been diseased with a carnosity which had resisted all endeavors, and in a manner totally suppress his urine." The urethra was opened behind the obstruction, and the cut kept patent, while dilatation with small bougies was attempted but failed. At the urgent solicitation of the patient Mr. Molins undertook a second operation, wherein he made a free external incision, involving the scrotal and perineal portions of the urethra, then applied sutures. The wound healed in a few days, but there remained a fistulous opening in the perinæum, through which the urine continued to flow.

Stalpart Van der Wiel quotes Solingen as having twice performed the operation, once at Livourne, and once at The Hague. The latter was upon a sailor, whose urethra he laid open from behind the glans to the perinæum, for the purpose of applying caustics to the "carnosities," and then brought the cut surfaces together with twisted sutures. This extensive wound seems to have healed, but the patient was afterward able to pass only a very small instrument.*

François Tolet, a French lithotomist of the seventeenth century,

* *Observat. Rarior. Med. Anat. Chir. Centuriæ Post. Pars Prior. Lugd. Batav.* 1687. pp. 409, 410.

Both Molins and Solingen practised extensive incisions, and had to resort to urethroraphy. The former was unsuccessful, but the latter is reported to have succeeded. In his "Note Historique et Critique sur l'Urethrotomie Externe," etc., *Archives Générales de Médecine*, 1857, vol. 2, p. 335, Mr. Verneuil mentions Lassus and Delpech as having employed the suture after free division of the urethra. Dieffenbach, Jobert de Lamballe and other authors describe their own peculiar methods of urethroplasty and urethroraphy. Unless the opening is very extensive or in the ante-scrotal portion, this operation is unnecessary, as cicatriza-

performed external perineal urethrotomy under the name of puncture of the perinæum, and speaks of having seen it done by others. He says: "If the parts which surround the urethra have become callous, and so hard that by their compression they have caused a stricture (*une angustie*), whence arises difficulty or suppression (retention) of urine, there is felt a fusiform hardness which extends from the perinæum toward the neck of the bladder." * He cites such a case and further says: "To cure this callosity, after having made, upon a *grooved staff*, an incision as if for the removal of a large stone, it was necessary, during the first few days, to pass a canula, etc." It will be seen, then, that Mr. Tolet not only performed external perineal urethrotomy for the cure of stricture, but employed a grooved staff as *conductor*. In 1690 François Colot operated for impassable stricture with fistulæ.† Civiale speaks of an operation performed by Colot on the 28th of June, 1687, for a narrow stricture of the urethra, in which a method "never before used" was employed. Colot's "design was to make a perineal incision without guide and without opening the urethra." He wished simply to excite suppuration and relax the parts, so as soon to be able to introduce a

tion may generally be expected, if, after the stricture has been completely divided, instruments of large calibre are employed.

Some years ago, the late Dr. W. R. Donaghe, of this city, employed urethraphy after division of a urethra obstructed by a series of strictures, from the meatus to the bulbo-membranous junction, with several perineal fistulæ. He slit open the whole canal along its floor from the external orifice to the membranous portion, and Dr. Emmet stitched the wound with silver wire; the parts did not wholly unite. A second, and finally a third operation was performed, but the patient, though somewhat relieved, and able to micturate through the natural passage, was still troubled with a perineal fistula and another fistulous opening at the base of the glans, capable of admitting a No. 12 sound.

* François Tolet, *Traité de la lithotomie ou de l'extraction de la pierre hors de la vessie*. Paris, 1708. 5ème édit., pp. 301, 302.

† Civiale, *Maladies des Organes Génito-Urinaires, etc.*, 3ème édit. Paris, 1858. Vol. I., p. 323.

catheter. This appears to have succeeded, and the patient passed twenty-four small calculi per urethram and was cured.*

In cases of "carinosities" incurable by leaden sounds, and followed by extravasation of urine and fistulæ, Jean Palfin recommends a method of external incision of the urethra in perinæo, which he had seen Colot employ at Paris. Palfin says, instead of using medicated bougies, he (Colot) made a perineal incision smaller than that for the extraction of a stone from the bladder, etc. †

Dionis advised, in retention of urine, puncture of the perinæum after the following plan: ‡ a narrow-pointed bistoury, four or five inches in length, is plunged into the bladder through the median raphé of the perinæum, at the site of the incision for lithotomy; then, through this wound, a cannula is introduced and made fast, and the urine drawn off. §

Tolet quotes Thévenin as having proposed the same method.

De la Faye, in his annotations to Dionis' *Cours d'opérations de Chirurgie*, recommends the division of strictures upon a guide staff, if such can be passed, and also speaks of puncture of the urethra behind the stricture with a trocar, for the relief of the bladder distended with urine. He quotes Petit and Morand as having practised this method with success. ||

In 1730, Ledran performed an operation for impassable stricture with fistulæ, the details of which I obtained from a translation of his work. ¶ I quote this case in full, as it illustrates

* Civiale, *op. cit.*, p. 325.

† *Anatomie du corps humain*, etc., Première partie, chapitre xx., p. 174. Paris, 1726.

‡ Dionis, *Cours d'opérations de Chirurgie*, 5ème édit., p. 196. Paris, 1765.

§ This operation has been revived, with modifications, by Mr. Edward Cock, of London. See *Guy's Hospital Reports*, vol. 12, p. 267.

|| Dionis, *op. cit.*, pp. 211 and 212.

¶ *The Operations of Surgery of Monsieur Ledran*. Translated by Mr. Gataker, with remarks, etc., by Mr. Cheselden, 3d edition, p. 382 et seq. London, 1757.

well the manner of proceeding at that time, and because in this instance the operation was done to cure the stricture and fistulæ, and not to relieve retention of urine :—

“I attended a patient who had such a number of callosities in the perinæum and scrotum, that I could not distinguish the testicles ; the scrotum and perinæum forming, as it were, one shapeless lump. These callosities had about thirty fistulous holes in them, through which the water passed only in drops. Very little urine came away through the penis, and as I could not introduce even the smallest bougie, I judged that the only method of curing the patient must be by an operation. Having, therefore, prepared him by twice bleeding, I placed him in the same position as in cutting for the stone, and made a very long and deep incision into the callosities on the perinæum near the part where I imagined the urethra to be, for I could not justly distinguish it, and with a second cut, I took away great part of the callosities on the side of that branch of the ischium which rises towards the os pubis ; immediately filling the wound with lint. The next day I placed the patient in the same posture to take off the dressings, and having removed the lint and directed him to make water, I observed the urine to pass through at several places ; I introduced a piece of bougie into the orifice that seemed nearest the urethra, and left it there ; but it was impossible to put in above an inch of it on account of the winding of the fistulous sinus. I then dressed the wound with a simple digestive, taking care to keep the lips open.

“The dressings were repeated the two succeeding days, and at each time I passed the bougie a little farther into the sinus. In short, the fifth day it entered into the urethra, of which I was fully convinced, when upon pushing it forward it passed into the bladder. Having gained one point thus far, I conveyed a director, the end of which was open along the bougie, and hav-

ing drawn away the bougie, the groove of the director served to pass in a bistoury, with which I opened the whole passage to the neck of the bladder inclusively; making the same incision as for the stone, and taking care to avoid cutting the rectum. This done, by means of the same director, I passed in a leaden canula, one end of which entered the bladder, and the other was fixed by the bandage even with the skin of the perinæum. The rest of the wound was dressed in the common way.”*

The canula was removed in three weeks; a catheter could then be introduced into the bladder through the normal route. The wound finally healed completely.

“I advised the patient afterwards to the use of bougies or a leaden probe, without which the urethra might gradually contract again, the cicatrix open and the disease return.”

The renowned J. L. Petit, who lived in the time of Ledran, also advocated external incision of the urethra in urinary fistulæ and in cases complicated with retention of urine, and strongly advised the operation, but with the double object of relieving the distended bladder and of curing the stricture. This soon became an established method which was extensively practised. Most surgeons of that period made their incision by the side of the raphé as for lithotomy, cut the urethra to the neck of the bladder, and often used the gorget for that purpose.

Col de Vilars, Astruc, Lassus and many others of that period are quoted as having advised and performed external incision of the urethra or the use of the trocar for the relief of retention of urine.

In 1783 (Sept. 19th), at St. George's Hospital, John Hunter performed an operation for the cure of fistula in perinæo arising from an impassable stricture of the urethra. Though he cut

* In our time such an operation would probably be completed at a single sitting.

down upon a staff passed to the stricture, he did not divide it, but, after searching for the opening of the constriction through the cut, succeeded in partially dilating it, and with some difficulty passed the instrument into the bladder. The catheter was retained until the 20th of November following, but as the wound showed no disposition to heal, on account, as he thought, of the *presence of the catheter*, this instrument was withdrawn. Soon after the removal of the catheter the wound "took on a more favorable aspect," and "on the 10th of December the urine no longer flowed by the wound," which in two days was completely healed, and the patient's "water came from him in a full stream and without pain." *

The same author recommends the following procedure in cases of impassable stricture with retention, after having tapped the urethra behind the obstruction :—"Where this operation is performed in consequence of a stricture, I have conceived that by passing a catheter into the urethra from the bladder till it comes to the stricture, and then passing another straight canula from the glans down the urethra, that the two may nearly meet, only having the stricture between them; and a piercer (*trocar*) may be passed down and forced into the end of the one from the bladder, and afterwards either a bougie or a hollow catheter introduced." †

Toward the close of the last century the mortality was so great after the operation of external perineal urethrotomy—on account, doubtless, in a large measure, of its being performed as the last resort, and deferred until the bladder and kidneys had become irreparably injured by the action of the frequently retained urine

* Treatise on the Venereal Disease, by John Hunter. Philadelphia edition, 1791, p. 148.

† Idem. Foot-note to chapter x., on "suppression" of urine, "and the operations for the cure of it," page 170.

—that Desault and Chopart denounced it in such vehement terms that few surgeons would perform it.

Mr. Sharpe also condemned the perineal puncture, with a trocar or knife, for the relief of retention of urine, and preferred in its stead the supra-pubic puncture of the bladder.*

It was then supposed that the operation had received its death-blow, and it fell into disuse both in France and in England at about the same time. It was revived in our own country by the late Dr. Alexander H. Stevens, who in 1817 cut open a strictured urethra in perinæo "with entire success, after the common modes of treatment had failed." †

From 1820 to 1823 Dr. Jameson, of Baltimore, had performed ten operations without a single death, his object in one case being both to cure the stricture and to remove a calculus. ‡

Dr. David L. Rogers, of this city, reported twelve cases of stricture which he successfully treated by external incision in perinæo; his first operation was performed in 1823. §

Two operations, by Dr. J. C. Warren, of Boston, were reported in 1829. ||

From 1838 to 1843, inclusive, fourteen operations of external perineal urethrotomy were performed at the New York Hospital by Drs. Hoffman, Post, Watson, and Buck, and from that time to the closing of that institution the operation has been performed seventy-five times by the various surgeons on duty. ¶

* A Treatise on the Operations of Surgery, etc., etc., by Samuel Sharpe, F.R.S., etc. Tenth edition. London, 1782. Chapter xv., pp. 77 and 78.

† Medical and Surgical Register; consisting chiefly of cases in the New York Hospital. Vol. i., p. 75. This periodical was edited by Drs. John Watts, Jr., Valentine Mott, and Alex. H. Stevens, and published by Collins & Co., 1818.

‡ American Medical Recorder. Vol. vii., 1824.

§ Philadelphia Medical and Physical Journal. Vol. xix., p. 186.

|| Boston Medical and Surgical Journal, July 7, 1829.

¶ For the use of the records of the New York Hospital I am indebted to the kind and obliging librarian, Dr. Vandervoort, and to Dr. Charles T. Poor, who was then preparing an index to the hospital case-books.

The late Dr. Alden March, of Albany, and many other American surgeons, had performed the operation prior to 1840.

All the operations above referred to were done without the aid of a conductor; but Petit's advice, of including in the incision the strictured portion of the canal, was, for the most part, strictly followed.

In former times the operation was usually done in a very rough way, with much random cutting and plunging in of trocars. It began to be better understood, and to gain favor rapidly, after its revival, in the beginning of the present century. The urethral incisions were no longer made so extensive, and the median line was selected as a safer and more direct route to the bladder, while the urethra was cut open on the end of a sound resting against the face of the stricture, and its orifice diligently sought for with a grooved probe, upon which it was divided longitudinally. Much credit is due to Mr. James M. Arnott and to Mr. Guthrie for these and other improvements in the operation. The name of *perineal section* was given to the improved operation, which is essentially what is now known under the title of *external perineal urethrotomy without conductor*. This mode of relief is especially indicated in cases of impassable strictures with retention or threatened retention of urine, and is eminently successful when properly and opportunely performed.

I have been obliged to perform external perineal urethrotomy without conductor in fourteen cases, all terminating favorably. This success is due principally to the fact that the operation was resorted to before any fatal complications could have occurred, and also because in most of the cases the orifice of the stricture was brought into view, and a clean, free, longitudinal cut made in the median line through the whole constriction.*

* See illustrative cases, in this and the next chapter.

EXTERNAL PERINEAL URETHROTOMY WITH CONDUCTOR.

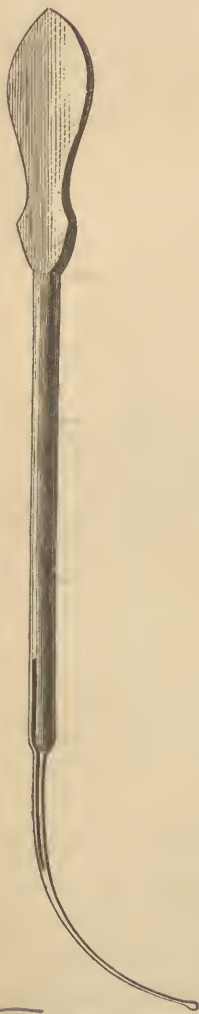


FIG. 44. Syme's Grooved Staff.

The operation of external perineal urethrotomy is greatly facilitated and simplified by the successful introduction of a small conducting bougie before any incision is made. This very old, but long-forgotten mode of operating was proposed and performed by Tolet, and also by de la Faye. The late Professor Syme, of Edinburgh, adopted it in 1840 in a case of stricture that had resisted dilatation and internal urethrotomy. Mr. Syme greatly improved the necessary instruments and introduced in the operation the new feature—so much insisted upon by Mr. Civiale—of including in the incision not only the strictured portion, but from a quarter to half an inch of uncontracted canal in front and behind the constriction. The objection to Mr. Syme's inflexible metallic guide staff (Fig. 44) * is, that one cannot be absolutely certain that it has not entered a false passage instead of being engaged in the stricture. This accident has occurred in the hands of very skilful surgeons. I witnessed it once, and the autopsy showed that the sound had deviated from the right channel, and that in consequence the stricture had escaped division. On that account I have endeavored

* The instrument represented by the wood-cut (Fig. 44) was kindly sent to me by Professor Spence, and is that which the Edinburgh surgeons have used for some years. It is probe-pointed and the smaller part is more slender than the ordinary instruments of Syme.

to substitute for Mr. Syme's a mode of operating by which the accident cannot well occur.

After numerous trials of the various modes of external perineal urethrotomy, and after a careful analysis of their defects and dangers, I have sought to devise a method by which the risk might be reduced to a minimum, and the steps of the operation rendered easy, safe and certain.

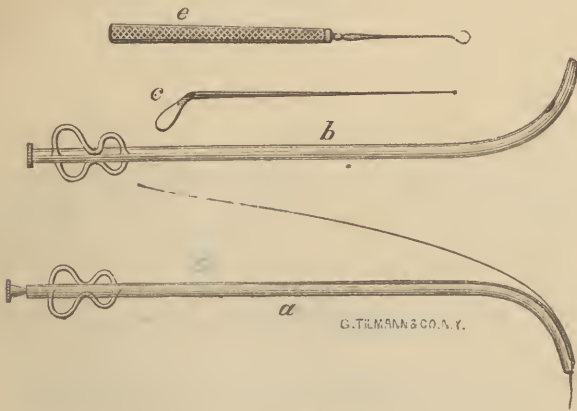


FIG. 45.

- a. Catheter staff, showing the conductor in the terminal canal, and the stylet a little withdrawn.
- b. Catheter staff, with eye on the concave side.
- c. Small grooved silver probe, with a broad handle, which can be bent to any angle.
- e. Small hook, for catching the loop of silk.

Operation.—The perinæum having been shaved, the patient is etherized. The urethra is explored with a flexible bulbous bougie, of proper size, to ascertain the exact seat of the obstruction. The canal is then filled with olive oil, and a capillary probe-pointed whalebone bougie is introduced into the urethra. If its point becomes engaged in a lacuna, it is withdrawn a little, and again carried onward with a rotary movement. If it enters a false passage, it is retained *in situ* by the left hand, while another is passed by its side. If this second guide makes its way into the false passage, it is to be treated

precisely as was the first, and the operation repeated till one guide can be made to pass the obstruction and enter the bladder. Sometimes five or six guides are thus caught before the false

passage is filled up and the natural route opened. I have frequently succeeded in thus reaching the bladder in very narrow strictures, supposed to have been impassable, and after all other means had failed. As soon as a guide enters the bladder—which may be known by the ease with which the instrument may be moved in and out—the other guides are withdrawn. The catheterism may also be conducted after the manner described at page 52.

The next step is to introduce a No. 8 grooved metallic catheter (Fig. 46, F), with a quarter of an inch of its extremity bridged over so as to convert the groove into a canal, the bridged portion itself being also grooved, G. Its introduction is accomplished by passing through the canal the free end of the retained guide, II, then holding the latter steadily between the thumb and index-finger of the left hand, and pushing the catheter-staff gently into the urethra until its point comes in contact with the face of the stricture. The staff and guide are then kept in position by an assistant, who at the same time supports the scrotum. The patient is placed in the lithotomy position, and held by two assistants, or better, by the aid of Pritchard's anklets and wristlets.

FIG. 46. The Author's grooved and tunnelled catheter-staff.

The surgeon, seated on a low chair, first makes a digital exploration per rectum, to ascertain, as far as practicable, the condition

of the membranous and prostatic divisions of the urethra; then he makes a free incision in the median line of the perinæum, extending from the base of the scrotum to within half an inch of the margin of the anus, involving only the skin and superficial fascia. The external incision usually recommended in this operation, is from one inch to one inch and a half in length; but I believe that free external incisions here, as in lithotomy, are of decided advantage, as they expose fairly to view the subjacent parts, and tend to prevent subsequent infiltration of urine in the superficial layers. A few well-directed cuts having brought into view the urethra, the operator, with his finger-nail, feels for the groove on the bridged portion of the staff, and opens the canal upon this groove longitudinally, in the median line, exposing to sight the instrument. A loop of silk is then passed through each edge of the incised urethra, close to the face of the stricture, and held by the assistant in charge of the corresponding limb. This excellent contrivance, suggested and employed many years ago by Mr. Avery, of Charing-Cross



Fig. 47. The author's beaked bistoury.

Hospital, London, is of the greatest service, and ought not to be omitted, as it constantly keeps in view the median line. When the urethra is opened, and the loops are secured, the catheter is withdrawn a little, so as to bring into view the black guide; then the stricture, with about half an inch of the uncontracted canal behind it, is divided. This, I think, is best accomplished by means of the small knife (Fig. 47) which I have modified from Weber's instrument for slitting the canaliculus lachrymalis. It is a very narrow, beaked, straight bistoury, about the size of a small probe, and is made to enter the stricture alongside

of the guide, as if it were a probe, and the incision is done by directing the edge downward. The last step is to pass the catheter-staff, guided by the whalebone bougie, into the bladder; but, should it be arrested in its course, the knife must be re-introduced, and the incision extended farther back. The operation is thus completed without unnecessary delay, the bladder is entered with the greatest gentleness; and, by the free flow of urine through the catheter, the surgeon is certain that the instrument has gone in the right direction, that he has divided the stricture thoroughly, and that he has not simply enlarged a false passage.

This method is, I think, particularly well adapted to cases where the urethra is deep-seated, or where there is great induration or tumefaction of the perinæum, from old-standing trouble, or from extravasation of urine. The presence in the bladder of the whalebone guide, so firm, though so delicate; the assured position of the catheter-staff, compelled to follow the guide which lies in its terminal canal; the light thrown into the wound through the agency of the loops of silk, which constantly indicate the situation of the urethra, and of the median line; the ease and certainty with which the catheter-staff—still sliding over the guide—is made to enter the bladder after the incision; all seem to me to contribute to the success of the operation, in difficult cases especially, more than any other means which I have employed. Where the initial introduction of the whalebone guide is impossible, it may be passed through the perineal wound into the bladder, and the stricture divided as before; or Arnott's grooved probe may be used as a guide for the incision, and the whalebone bougie then passed along its groove. In either case, with the guide in the bladder after the incision, the point of the catheter-staff may be protruded from the wound, the free end of the guide carried through the terminal canal, and the bladder entered as before described.

Preparatory Treatment.—When the state of the patient is such that the operation may be safely postponed, which can almost always be done when there is not impassable stricture with retention or extravasation of urine, I am in the habit of adopting, for a week or so, the following course of preparatory treatment:—

The patient is confined, as far as possible, to the recumbent posture, and is directed to take a warm hip-bath every night. A diluent drink is to be freely used, ten drops of the tincture of chloride of iron taken three times daily, and five grains of quinine at bed-time. A suppository, containing one grain of the aqueous extract of opium, and half a grain of the extract of belladonna, is introduced into the rectum every night to allay spasm and procure sleep. Finally, the bowels are emptied, by the aid of a dose of oil, the evening before the operation. On the morning of the operation an enema is given, to completely free the rectum from fæces.

After-treatment.—After the operation is concluded, and before the patient has fairly recovered from the effects of the anæsthesia, ten grains of quinine, with a quarter of a grain of morphia, are administered; and as soon as the nausea produced by the anæsthetic has subsided, a broth is given. On the following day the diluent and iron are resumed, with the addition of three grains of quinine three times daily, and continued for two or three weeks. After four or five days, a warm hip-bath should be taken daily.

I believe that such a course of treatment is likely to prevent the occurrence of many of the unpleasant symptoms which sometimes follow the operation. The surgical after-treatment is at first similar to that observed in lithotomy. The scrotum is supported by a suspensory bandage, to guard against any possibility of infiltration of urine into its connective tissue, and the patient

is kept on his back. Generally, the first time he urinates, most of the urine flows through the perineal wound; but afterward, for forty-eight hours, all the urine escapes through the proper channel, from swelling and contact of the lips of the wound; as soon as the swelling subsides, and suppuration is established, a certain quantity of urine again passes through the perineal wound, but no harm ensues.

In the great majority of my operations, both of internal and of external urethrotomy, I have not followed the usual practice of tying in a catheter, for reasons which I shall presently state.

The wound is not disturbed, and no instrument is passed into the bladder until the second day, and then a full-sized, highly-polished conical steel sound, of proper curve, is introduced, and the introduction repeated every third day, until the wound has healed—which takes place generally within four weeks—and then the patient is taught to pass the instrument for himself, and is advised to continue its use indefinitely.

As the retention of a catheter, for a longer or shorter time after this operation, has been and is still strenuously insisted upon by many surgeons, I will state, briefly, the facts which at first convinced me of its uselessness, and finally of its occasional danger:

F. B. (Case I., page 146) came to me, in the latter part of 1860, with threatened retention of urine, from impassable stricture of the urethra. His condition was such that I determined to give him the benefit of the external section, which was done without the aid of any staff or guide. An impassable stricture, in the pendulous portion of the urethra, rendered impossible the passage of a catheter to be retained *in situ*. As I had never known bad results to occur from the contact of the urine with the freshly-incised surface after the operation of lithotomy, I concluded not to retain the catheter with which I had withdrawn the urine through the perineal wound, notwithstanding the warnings of Mr. Syme, and of other good authorities, that such a pro-

cedure is dangerous. I preferred to allow the urine free flow through the artificial opening, without the aid of any catheter or canula. No urethral fever, or indeed any untoward symptom ensued, and the perineal wound cicatrized in six weeks.

McW. (Case XXVIII., chap. viii.) applied for relief in June, 1861. He was at that time suffering from retention of urine, consequent upon stricture of the urethra. His bladder was distended to such a degree as to reach the level of the umbilicus, and various means had been tried for its relief, but in vain. He was at once subjected to the external division, without guide, in order to ward off extravasation and its consequences. A No. 12 silver catheter was then introduced into his bladder, and tied in position, but two hours afterwards I was called to see the patient, and found that he had pulled it out. I endeavored to re-introduce the instrument, but the man became so unruly that I abandoned the idea, and left him to pass his urine through the wound. No urethral fever or any other bad symptom followed; and he made an excellent and rapid recovery. In about four weeks the wound was healed.

The following case shows some of the ill effects of prolonged retention of the catheter:—

A. F., sailor, was sent to me for operation, by my friend Professor Van Buren, in April, 1864. He was then suffering from impassable stricture, the result of gonorrhœa. He had previously resorted to a hospital in one of our sister cities for treatment, and in May, 1860, perineal section was performed upon him for impassable stricture five and a half inches down. The patient remained in the hospital four months after the operation, wearing a flexible instrument during the whole period, with the exception of the last month, when the catheter was only retained at night. The perineal wound did not heal till the end of the third month. When he left the hospital he had learned to pass for himself a No. 12 flexible bougie; but in the course of a few months the instrument became so much worn that he was forced to cease its use, and, being at sea, he could not procure a new one. The stricture soon began to recontract, and symptoms of cystitis appeared. When I saw him in April, 1864, his urethra was found thickened, and No. $\frac{1}{2}$ bougie could not be introduced.

On June 11, 1864, I performed upon him external perineal urethrotomy without the previous introduction of a guide, as I could get none

through ; but, after having incised the urethra, I succeeded in passing through the obstruction a very slender grooved probe, such as that recommended by Mr. Arnott, and, thus guided, I was able to divide the stricture freely.

By request, and contrary to my own convictions, I introduced and tied in position a No. 12 silver catheter, which was allowed to remain undisturbed for forty-eight hours. On the third day the patient was attacked with urethral fever, and on the fourth he had a retention of urine, with aggravation of his cystitis, induced, as I believe, by the presence of the catheter. He finally made a good recovery, and returned to his occupation, having learned to introduce for himself a highly-polished No. 17 conical steel sound.

REMARKS.—Judging from the high reputation of his surgeon, I inferred that the operation which had been performed in May, 1860, was properly done, and assumed that the stricture had been thoroughly divided, but the after-treatment was not beyond criticism. An elastic catheter was introduced and retained in position, and when withdrawn it was found thickly incrustated with the salts of the urine. Could such a foreign body remain so long in the urethra and bladder without creating much irritation, and could it fail to prove otherwise than injurious? Still the wound healed, in spite of this interference, at the end of the third month. The irritation kept up by that foreign body would not have arisen had he been left to pass his urine through the perineal wound, as are nearly all patients, in our days, after lithotomy.

The alleged reasons for tying a catheter *in situ*, to be worn until the wound has healed, are, first, to prevent the urine from coming in contact with the recently-cut surface ; and, second, to hasten union, by still endeavoring to prevent the urine from passing through the granulating wound.

That a catheter tied in position does not prevent the urine from escaping between it and the urethral walls, however large the instrument may be, has long since been demonstrated, and there are

few surgeons of experience who have not verified this fact. That the presence of the catheter does not hasten, but, on the contrary, does retard the progress of union of the perineal wound, is well illustrated by the case which is the subject of these comments. Other illustrative cases are not wanting in the records of hospitals.

I believe that the presence of the catheter, in the case just referred to, was among the most prominent causes of the recurrence of the stricture, and I do not see why the chronic urethritis thus induced should not have acted as that which had originally given rise to the stricture.

The following case is an instance of severe recurring chills occasioned by the retention of the catheter:—

W. S. fell with one leg down a hatchway, striking his perinæum against its raised edge, but without a great degree of force, on the 22d of February, 1865. He was immediately conscious of bleeding from the urethra, and lost, in a pretty continuous flow, about a gill of blood. He refrained, through fear of pain, from attempting to pass water for about fourteen hours, and then failing in the attempt, a catheter was introduced, but no urine flowed—apparently from clogging of the eyes of the instrument by coagulated blood. Half an hour afterward, while lying in his bunk, a few drops of urine escaped involuntarily, but on rising and making an effort the stream ceased; when he fell asleep shortly afterward, his bladder relieved itself spontaneously, and for the two days ensuing he passed a pretty full stream; but on the third day contraction commenced, and in two weeks he again had retention, but no instruments could be passed, although attempted daily for two months, his urine being passed meanwhile with great pain, much straining, and only in drops.

In this condition he was subjected to perineal section by one of my colleagues, on the 19th of August following, and a No. 8 silver catheter retained in the bladder. Severe chills recurring daily, the catheter was removed on the fourth day, and it could not afterward be introduced; but the chills ceased, and the patient was able to pass his water partly through the urethra, and partly through the perineal wound. As the latter tended to heal, the urethral stream was noticed to be again diminishing in size, and at the end of three months it had become quite small,

and the wound in the perinæum had contracted to a fistulous orifice which showed no further tendency to close, more or less urine escaping through it at each effort to urinate. On the 16th of December following, Dr. Van Buren saw the patient in consultation with me at St. Vincent's Hospital, and advised a repetition of the operation of external perineal urethrotomy. After the administration of ether, I performed the operation with the aid of a delicate bougie as a conductor. The stricture was freely divided, and a No. 14 steel sound could be readily passed into the bladder.

No catheter was retained in position. The sound was introduced daily for five days, and after this every second day. He had no chill or fever; the urine came freely through the wound, until it closed entirely at the end of three weeks. He was then taught to introduce his own instrument, and remained under observation for two years.*

In nearly all my cases—thirty-one in number—I have adhered to the rules given by Mr. Syne, to be observed in the operation of "External Urethrotomy," with the exceptions to be presently mentioned.

Mr. Syne's directions, as summarized by Sir Henry Thompson, are as follows:—

1. Maintain the median line in the incisions.
2. Make a direct opening down to the staff, and not a tortuous one.
3. Divide the whole of the contracted part, rather more than less.
4. Do not cut so far back as to endanger the deep fascia of the perinæum, and use the knife in the deep incisions with the cutting-edge uppermost.
5. Do not close the end of the inlying catheter, lest urine be forced into or through the wound for want of patency in the instrument.
6. Avoid escape or displacement of the instrument.

* This case was reported in the New York Medical Record, vol. i., No. 8, p 181.

7. If incisions are made far back, introduce the curved tube through the wound when the catheter is withdrawn.

8. Do not neglect dilatation during the progress of recovery.

I have, perhaps, departed from the fourth rule, by dividing the anterior layer of the deep perineal fascia in several cases of traumatic stricture at the bulbo-membranous junction, but no harm has come of this. It is scarcely possible to divide freely such strictures without running the risk of cutting that portion of the deep fascia of the perinæum. It is always divided in lithotomy, and there are seldom if ever any serious consequences. In a number of cases also I have cut with the edge of the knife downward in making the deep incisions, and no mischief has resulted.

Rules fifth, sixth, and seventh have also been departed from in all but two cases, and in these two I feel confident that the retention of the catheter was the cause of urethral fever, and in one of them, also, of the aggravation of old cystitis.

I believe that the retention of a catheter in the bladder, after external perineal urethrotomy, even for forty-eight hours, is not only unnecessary but harmful. Unnecessary, because it does not fulfil the supposed indication of preventing the flow of urine through the wound, and because the contact of the urine with the freshly-cut surfaces does no harm, as is exemplified by lateral and median lithotomy, and also by the cases which have been detailed. Harmful, because the presence of the instrument—a foreign body—in the bladder sometimes causes ulceration and perforation of that viscus, and does give rise to inflammation and to urethral fever.

Vidal (de Cassis) says, however great may be the calibre of the catheter, a certain quantity of urine always flows between it and the urethra.*

* *Traité de Pathologie Externe et de Médecine Opératoire.* Paris, 1841, t. v. p. 259.

Sir Henry Thompson, in speaking of the treatment of obstinate fistulæ, says: "Experience shows that, however large the instrument may be, and however closely it may fit the urethra at the present moment, before twenty-four or thirty-six hours have elapsed, it will lie loosely in the canal, and urine will pass by its side."

He further says: "The mode of treatment, therefore, which consists of tying in a catheter, is to be regarded as inadequate to the cure of fistula, except so far as it produces dilatation; and it is one which has obtained countenance chiefly from the plausibility of a theory which is certainly unsupported in practice." *

Mr. Syme, in referring to "between eighty and ninety" cases of external division, says:—"Alarming symptoms were by no means rare, since every third or fourth patient suffered from rigors, vomiting, delirium, or suppression of urine."† No doubt exists in my mind that the presence of the catheter in the bladder was the exciting cause of these grave symptoms.

After having treated this large number of patients without any death, Mr. Syme met with two fatal cases, and he attributed these deaths to the contact of the urine with the wound, and then proposed the use of a short catheter, to be introduced into the bladder through the perineal wound, and secured in position. But this, though not so harmful, is, I believe, quite as unnecessary as the use of the long catheter.

A medical gentleman of New York city related to me the history of a patient on whom the "perineal section" had been performed, and where ulceration took place at the peno-scrotal junction, from the prolonged retention of a silver catheter, so that the

* On the Pathology and Treatment of Stricture of the Urethra and Urinary Fistulæ. London, 1858, p. 360.

† Lancet, August 21, 1858, p. 191.

instrument could be seen through the fistulous opening, which showed no disposition to heal.

Dr. Bumstead * alludes to a similar case in a patient who had been operated upon in California ; and he also relates one instance where death occurred from retention of the catheter for a fortnight, "and at the post-mortem examination there was found a small, but deep ulceration of the bladder, and another, quite extensive, of the inferior wall of the urethra in front of the scrotum, which was only separated from the surface by the integument."

A fatal case occurred in the practice of Professor Spence, of Edinburgh, where "peritonitis was produced by the partial penetration of the coats of the bladder by the in-lying catheter," which had only been retained *in situ* for forty-five hours. I find it recorded in Sir Henry Thompson's Treatise on Stricture, etc., London, 1858, page 278. The retention of a catheter for forty-eight hours, in cases 4 and 19, gave rise to urethral fever, and to cystitis. The retention of the instrument for four days, in W. S., gave rise to severe recurring chills, and it had to be withdrawn in consequence. But, after the second operation, no catheter was tied in, and the patient did not suffer from rigors, or from any other discomfort.

Is it not fair, then, after all this accumulated evidence, to conclude that the retention of the catheter in the bladder, passed either through the whole length of the urethra or through the perineal wound, does not fulfil the indications for which it is used ; that it is, as a general rule, attended with danger, and that its omission is a safe measure ?

In certain cases of traumatic stricture, especially where the urethra has been torn completely across, or where occlusion of the canal has taken place at the seat of injury, an exception to

* On the Pathology and Treatment of Venereal Diseases, 1866, p. 316.

the rule of leaving out the catheter may be made, though it may well be questioned whether, even under these circumstances, the instrument is needed.

After I had performed the external division for occlusion of the urethra at the seat of injury, I once debated the propriety of leaving in a new gum-catheter, and renewing the instrument daily for a week—the same instrument never to be employed a second time, in order more surely to avoid the danger of incrustation. But this plan was not carried out, and the patient did well.

The eighth rule should, in my opinion, never be departed from; on the contrary, the use of large instruments should be continued indefinitely, and not, as sometimes recommended, only during the progress of recovery. It is well known that, if large instruments are not introduced at intervals of a week or two after the union of the wound, a certain amount of recontraction will take place, although probably not to an extent to give rise to so bad a stricture as before, unless the original causes of the trouble should recur—such as gonorrhœa, injury of the perinæum, debauch, exposure, etc. Patients who have been taught to introduce their own steel sounds, should, for as long a time as possible, be retained under observation, and the importance of keeping the instruments free from rust and smoothly polished, and the necessity of great gentleness in their use, constantly impressed upon them; for careless and rough manipulation, by giving rise to urethritis, or to laceration of the mucous membrane, is apt to cause relapse.

The rough use of the sound will sometimes bring on orchitis. The too frequent introduction of the instrument also occasionally produces this result. Another fact, worthy of remembrance, is, that the sound should not be retained in the urethra longer than five minutes. There are patients who are liable to attacks of orchitis in spite of the greatest care and gentleness in the use of

the sound. This may sometimes be averted by advising them to take the following precautions :—

1. Use a diluent drink through the day preceding and the one following the introduction of the instrument.
2. Take a warm hip-bath immediately after.
3. Support the testicles with a suspensory bandage.
4. Remain in the horizontal posture for twelve hours.

In the case of workingmen, or others who are obliged to be about through the week, it is well to recommend them to pass the instrument every Saturday evening after working hours, that additional rest may be had on the day following, if necessary, without loss of valuable time.

The term large instrument is only relative; the diameter of the sound should be proportionate to that of the uncontracted part of the urethra, and if the meatus is abnormally narrow, it should be freely incised longitudinally along its floor, and the calibre of the canal then estimated. Some urethræ will only admit No. 12, while others are sufficiently capacious to permit the easy introduction of No. 18, an instrument of nearly $10\frac{1}{2}$ millimetres (over three-eighths of an inch) in diameter.

This after-treatment of the external division of strictures is analogous to the treatment of deep burns near the flexures of the limbs, when it is so desirable to keep the member in an extended position, in order to obtain a *wide cicatricial splice*, and thus allow for subsequent contraction.

Mr. Reybard,* having demonstrated that longitudinal wounds of the urethra do not generally give rise to stricture, recommends† that, during cicatrization—after the division of strictures—a large instrument be introduced, or, better, a dilator to

* *Traité pratique sur les rétrécissements de l'urètre*, etc. Paris, 1858, pp. 63, 64.

† *Loc. cit.*, p. 442.

separate the lips of the wound, and thus to augment the width of the cicatrix.

Estimate of the Operation.—To arrive at a correct appreciation of the value of the operation of external division of strictures of the urethra, it is necessary to consider :—

1. Under what circumstances the operation is justifiable?
2. What amount of danger attends its performance; and
3. How far it is entitled to be considered as a means of cure?

Sir Henry Thompson, after whom the last two inquiries are phrased, says: "It has been stated that the hazard to which the patient's life is exposed by it (the operation) is too great to be incurred for the sake of obtaining a cure of his complaint. This view has not improbably arisen, in some measure, from the still common but erroneous habit, already alluded to, of confounding external division of a permeable stricture upon a sound with the operation upon an impassable one without it." *

Professor Van Buren, in a published lecture,† remarks: "The dangers of this operation depend upon the conditions which necessitate its performance, rather than upon the proceeding itself. If, as is always desirable, its necessity has been foreseen, and time secured for the examination of the internal organs, and ample preparation made, *the danger is trivial*; but if, on the contrary, as often happens in hospital practice, the patient falls into the surgeon's hands with prolonged retention or extravasation of urine, from recklessness and neglect, the operation is likely to be much less favorable. And if, in addition to these serious complications, the stricture should prove to be impassable, and the operation is necessarily undertaken without any guide to the bladder, it becomes *one of the most difficult and uncertain proceedings of surgery*. The alternative of puncture

* Thompson, op. cit., p. 278.

† Medical Record, Vol. i., p. 280.

of the bladder from the rectum, or above the pubes, may in rare cases be adopted from necessity; but these measures afford only temporary respite, inasmuch as they leave the stricture, the cause of all the trouble, unrelieved."

Dr. Markoe says: * "It must be evident to you that the success or failure of it depends upon the condition of the patient for which the operation becomes necessary; that the dangers of the operation itself can hardly be separated from those of the disease for which it is performed. Being a last and only resort for a desperate condition of things, we cannot select our cases or prepare them for the operation."

Professor S. D. Gross observes: "The operation is by no means free from danger, and requires the most consummate skill for its successful execution. None but a madman or a fool would attempt it, unless he had a profound knowledge of the anatomy of the parts, and a thorough acquaintance with the use of instruments."†

I have quoted the opinions of these distinguished surgeons—pertinent to the estimate of the operation—as fairly mirroring the advanced mind of the profession, and that I may express my general accordance. But I must insist, most emphatically, upon a correct interpretation of the words, "the operation being a last resource." While, beyond all question, the conscientious surgeon must propose to himself all other available and justifiable means of relief, yet, when these have been tried and have failed, the knife is not only the "last resource," but the *only* resource, and must be promptly and resolutely applied. The operation has often been deferred so long, that the bladder and

* Clinical Lecture on Perineal Section, etc., American Medical Times, Vol. i., p. 55.

† Diseases and Injuries of the Bladder, Prostate, and Urethra. Second Edition. Philadelphia, 1855, p. 801.

kidneys have become irreparably damaged by the action of the frequently-retained urine, and finally the knife is used when all operative procedures are contra-indicated. This long delay accounts in a great measure, as I believe, for the large percentage of mortality which has followed the operation, and has brought it into dispute.

1. *The first consideration*, namely, under what circumstances the operation is justifiable, has been discussed with warmth, and extreme views taken thereof, by three classes of surgeons. The first class resort to cutting forthwith, in every case of narrow stricture, and assume that no other mode of treatment is applicable. The second class assert that "it is not necessary in cases where an instrument can be passed into the bladder." The third class are of opinion that "the hazard to which the patient's life is exposed by it (the operation) is too great to be incurred for the sake of obtaining a cure of his complaint," that it is consequently unjustifiable, and that it should under no circumstances be resorted to. These diverse views have caused no little perplexity in the minds of the inexperienced.

The advances that have been made in our knowledge of the pathology and treatment of stricture of the urethra indicate a moderate and middle course to be pursued. It is now believed, by conservative and judicious surgeons, that the class of cases which requires this operation is small, and that, even in these cases, before resorting to the knife, gradual dilatation and all the other available means of relief should be thoroughly and faithfully tried. Impermeability, resiliency, or great irritability of strictures are indications by which these surgeons are influenced in the adoption of this mode of treatment. In impassable strictures, attended with retention or extravasation of urine, or where there exist obstinate urinary fistulae, few now entertain any doubt of the propriety of the operation. Narrow strictures, from tran-

matic lesions, are, it is thought, sufficient, as a general rule, to warrant the external perineal division.

2. *The proper appreciation of the second consideration*, namely, what amount of danger attends the performance of the operation, is of the greatest importance, as the risks of the operation have been greatly exaggerated, and some of them are more imaginary than real.

Much credit is due to Professor Syme, of Edinburgh, for recalling the attention of the surgical world to the operation, and for demonstrating subsequently, by a large number of successful cases, that it was not as perilous as was formerly believed, provided it was done with due caution and at the proper time. Now the operation is as firmly established, and is considered as safe, as lithotomy,—in cases uncomplicated with advanced disease of the bladder and kidneys,—even where no guide can be introduced. In my own experience, the operation without a conductor has been attended with no ill results. In the thirty-one illustrative cases appended to this and the next chapter, it will be noticed that not a single death has occurred among the fourteen patients operated upon in this manner.

Mr. Syme makes permeability a prerequisite to the performance of this operation. He assumes that there are no impermeable strictures of idiopathic origin, and that, if urine flows through the canal, an instrument can be made to enter the bladder by the exercise of patience and of sufficient dexterity. Nearly every surgeon of experience has been able to verify the fact that there are some strictures which are impassable to instruments of the minutest diameter, while they are permeable to the urine, and this, together with Mr. Syme's acknowledged failure to introduce a conductor in some instances, renders it superfluous for me to give any examples, or to defend the operation in impassable, or even in impermeable strictures, when the other indications are

clear, especially since for the last half century the external section has been done in this country, for such cases, with great success.

On the other hand, those extremists, who assert that permeability to instruments necessarily contraindicates the operation, meet with very few supporters. The aim of the majority of surgeons, in our day, is to endeavor to pass in a conductor, but when this is not practicable, they operate without it, for the double purpose of dividing the stricture, and of relieving or averting retention of urine.

In 345 operations of external division of strictures performed by American surgeons, 233 of which were done without a conductor, there were forty-one deaths; about twelve per cent. The assigned causes of death were: advanced disease of the bladder and kidneys in twenty-two cases, pyæmia in fifteen cases, erysipelas and pyæmia in one case, intra-pelvic abscess and pyæmia in one case, and thrombosis in two cases.

According to the late Professor Miller, of the University of Edinburgh, the following are the dangers which attend the performance of the operation: *

1. Hæmorrhage.
2. Infiltration of urine.
3. Abscess in or near the wound, leading perhaps to fistula and irritative fever.
4. Intra-pelvic abscess.
5. Erysipelas.
6. Pyæmia.

Not a single case of fatal hæmorrhage has been mentioned as having occurred among the 345 patients referred to above, the prominent features in many of which were kindly furnished me by the operators themselves.

* Wade on Stricture of the Urethra, etc., London, 1853, p. 209.

Of these 345 patients there were but two who lost more than the usual amount of blood; in one case the hæmorrhage was from an anomalous branch of the artery of the bulb, which was controlled by ligature; in the other case—one of my own patients—about one pint and a half of blood was lost from oozing, but the hæmorrhage ceased spontaneously and did not recur.

Troublesome hæmorrhage would, then, seem to be of very rare occurrence in this operation, though, among some cases reported by Sir Henry Thompson, Professor Syme, and Mr. Henry Smith, there were a few fatal results.

Infiltration of urine after the operation is only liable to take place when the external incision is small, or when the attendant has neglected to support the scrotum with a sling-bandage. Abscess in or near the wound is not apt to ensue if the lips of the wound are kept asunder, and union by granulation promoted.

Only one intra-pelvic abscess was reported among the 345 cases before referred to, and there pyæmia coexisted. I believe that it will not usually follow, except as a secondary abscess, unless the incision should involve the pelvic fascia, and I can scarcely conceive of any constriction of the urethra which would necessitate so extensive an incision.

I have witnessed but one case of erysipelas, and, in that, neither the wound nor the genitals were affected. This is a complication which is liable to attend any surgical operation, and belongs to the wards of an infected hospital.

Pyæmia may be placed in the same category as erysipelas, though a large proportion of deaths is credited to it, but it is just as liable to occur after divulsion or *internal* urethrotomy as after the external division.

In these 345 cases, the greatest proportion of deaths was due to advanced disease of the bladder and kidneys—chronic cystitis, with concentric hypertrophy of the bladder, pyelitis, and renal

abscesses, having been found in many of the cases. This condition of the urinary organs can frequently be discovered in time; and under such circumstances the operation is contraindicated. If, then, we deduct the twenty-two deaths which were attributed to this cause, we have here a mortality of about five and a half per cent. as the legitimate mortality of the operation.

3. *The third consideration* must now come up for investigation, namely—how far the operation is to be considered as a means of cure. Sir Henry Thompson makes the three following points:—

1. "It may fail to afford any relief."
2. "It may cure for a short period, and afterward be followed by a relapse."
3. "It may effect a permanent cure."

It may fail to afford relief if the stricture has escaped division, or, as Thompson suggests, if the occurrence of sloughing has prevented the possibility of the union of the wound. I have observed cases of failure from the former, but never from the latter cause. Fatal cases are of course excluded from consideration.

It will only afford temporary relief if the stricture has not been completely divided; if the patient has neglected the periodical introduction of a sound; or if there is a recurrence of the original cause of the trouble. Mr. Syme attributes relapse to these causes, and also to the too rapid union of the wound.

It is now believed that the operation will afford permanent relief only so long as the patient continues the use of a full-sized instrument at intervals of a week or two; and, so far as I am aware, there is no method of treatment as yet devised, for obstinate stricture of the urethra, which will effect a permanent cure, without the occasional use of a sound.

In conclusion, I will advert to a few cases, out of many in my

possession, which have been treated by surgeons of New York, to show how much can sometimes be expected from this operation.

Prof. Post, of the University of New York, performed the operation twenty-three years ago, upon a patient who is now in the enjoyment of excellent health, is passing a good stream of urine, and is still introducing a full-sized instrument.

A gentleman, on whom Prof. Van Buren had performed the external section for traumatic stricture, twenty years before, was under my care about five years ago, and I passed for him, once a fortnight, a No. 11 conical sound.

I assisted the same surgeon in a similar operation eight years since, the subject of which I see from time to time; he is in excellent health, and introduces for himself, once a week, a No. 12 conical sound.

Dr. J. J. Crane, of New York city, mentioned to me two cases operated upon by him—one twelve years ago, and the other seven years previously; they are still in good condition. I saw the latter patient with him three years ago, and was able to pass a No. 10 instrument. He had had more or less trouble after the operation, because of his neglect to use the sound; latterly, however, the instrument has been introduced at regular intervals, and he has greatly improved.

Dr. Lewis A. Sayre related to me the history of a patient, on whom he had done the operation of external division twenty-one years ago. The man is still in very good health, and has had no symptoms of relapse.

One of my own patients returned to me eight years after the operation, without any recontraction, though he had used no instrument.

The following histories of thirty-one cases of idiopathic and traumatic strictures, appended to illustrate the treatment

by external perineal urethrotomy, without and with conductor, exhibit twenty-seven successful results and four deaths.

CASE I.—*Impassable stricture from gonorrhœa—Threatened retention—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.*

F. B., æt. 47, came to me in the latter part of the year 1860, with threatened retention, caused by a stricture of the urethra which had followed gonorrhœa, suffering great pain from over-distension of the bladder and dribbling of urine.

On preparing to introduce an instrument I discovered a circumscribed swelling near the right crus penis which he said had made its appearance but a few days before. The attempt to pass a bougie of moderate size was foiled by an obstruction, three and a half inches from the meatus, which was so complete as to prevent the introduction of even the smallest flexible instrument. As I could accomplish nothing at the time in this way, I did not think it wise to proceed to immediate operation. I sent the patient to Bellevue Hospital, kept him under observation for a week, while persistent and careful attempts were made to pass an instrument into the bladder. As no success was attained, even with the most delicate flexible bougies, and as complete retention was impending, it was decided upon consultation to perform external perineal urethrotomy and give free vent to the urine, and to treat the stricture at leisure.

Accordingly, on December 26, 1860, the patient was etherized, and an incision made in the mesial line sufficiently free to give a good view of the bulb of the urethra; the incision was then carried through the bulb and into the urethral canal, the opening being made large enough to admit a small director, in order to test the permeability of the canal to that point. A second tight stricture was there discovered, which allowed the director to pass it, and which was thoroughly divided upon its groove with a sharp-pointed bistoury, the urethra both before and behind the stricture being also freely laid open. This stricture was seated in the posterior part of the sinus of the bulb. As soon as this wound was completed a considerable quantity of urine escaped, and the bladder was then emptied by means of a flexible catheter introduced through the perinæum. The swelling at the root of the penis was then opened, and about half an ounce of pus escaped.

The perineal incision was kept open, that nothing might unduly in-

terfere with dilatation of the anterior stricture; but after the latter began to yield, this necessity ceased, and at the expiration of six weeks the wound was healed, and a No. 8 steel sound could be passed the whole length of the urethra.

Dilatation was attempted for six weeks longer without much gain, and the stricture was then divided with Civiale's urethrotome, and steel sounds, to No. 14, introduced every second day.

No catheter was retained after either operation, and the patient had no urethral fever, and indeed not an untoward symptom throughout the whole course of treatment. He was taught to introduce an instrument for himself, and was discharged from the hospital within a month after the second operation.

Four years subsequently this patient called upon me to report, saying that he always passed a good stream, and had experienced no trouble since leaving the hospital. But he confessed that he had neglected the use of his sound, and had not led a very sober life. I attempted to introduce an instrument, which was arrested at a point three and a half inches from the meatus, and advised him to return for further treatment, that full dilatation with the larger instruments might be accomplished, but he did not return.

He was readmitted to Bellevue Hospital, March 20, 1868. Three months before he had had a retention of urine from exposure. Medical aid was invoked, but no relief obtained. On the evening of the second day extravasation took place, followed by sloughing and the escape of urine. In due time the parts cicatrized, leaving behind two fistulous openings, through which nearly all the urine was discharged. One fistula was seated at the peno-scrotal junction, the other near the right crus penis; the site of the abscess opened in December, 1860. These facts all went to show that the posterior stricture had not recontracted sufficiently to give rise to much inconvenience, and that all his troubles had arisen from the anterior stricture.

He had been confined to bed for over two months, and when admitted to the hospital was very feeble and anæmic. Urine was constantly dribbling from the fistulous openings, and kept his garments soiled and his scrotum and thighs excoriated. No water passed through the anterior part of the urethra. A moderate-sized bulbous bougie was arrested three and a half inches from the external orifice, and the stricture admitted with difficulty the finest filiform bougie, but its repeated introduction caused the constriction to yield enough to allow the urine to

trickle by the natural passage. Afterwards Nos. 1 and 2 were passed and then No. 3 was engaged in the stricture, and each instrument was kept in from half an hour to an hour, while the stream of urine began to increase in size.

On March 28th No. 3 could with some difficulty be passed. From that date the fistulæ gradually contracted, the urine flowed wholly by its normal route, and he began to have control over his bladder long enough to enable him to go to the closet and relieve himself.

By the 5th of April his general health had greatly improved, he no longer suffered from overflow, and the fistulæ had completely healed. Daily warm hip-baths, diluents, and tincture of chloride of iron, were prescribed.

On April 12th, flexible bougie No. 3 was introduced into the bladder and retained twenty-four hours; it was only removed for micturition and immediately reintroduced by the patient himself.

On April 13th division was done with Thompson's instrument and No. 10 steel sound passed. Only a few drops of blood escaped, and no unpleasant symptoms followed. The sound was introduced every second day until April 22d, when No. 11 was passed; two days after No. 10 only could be introduced. On April 26th the divulsor was again applied and the blades separated to the extent of three-eighths of an inch. On May 21st I performed circumcision on account of a very long prepuce and a phimosis which interfered with the passage of large instruments. On May 26th the meatus was found too narrow to pass No. 14 without giving great pain; it was accordingly deeply incised with Civiale's "bistouri caché," and No. 18 introduced for two inches every day until the wound healed. Subsequently, No. 14 was passed every second day. It met no obstruction at the site of the stricture in the perinæum, which had been divided in 1860.

On June 3d he was discharged, at his urgent request, as he was anxious to go to work. He promised to continue the use of his No. 14, and to report occasionally.

CASE II.—*Impassable stricture in the region of the bulb—Impending retention—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.*

D., æt. 25, a discharged soldier (intemperate), applied for treatment at Bellevue Hospital in May, 1863, for stricture of the urethra, consequent upon several gonorrhœas.

On careful exploration with a bulbous bougie, I detected a linear stricture half an inch within the meatus, and another impassable contraction five and a half inches back.

An attempt was made to dilate these strictures, but after several weeks of patient trial it became evident that the case was not amenable to this mode of treatment; and as the patient was in imminent danger of retention and its consequences, I decided, after consultation with my colleagues, to perform external perineal urethrotomy, as the best means of affording him permanent relief, as well as of meeting the immediate demands of the case.

I proceeded to perform the operation by laying the perinæum open freely in the median line, and making an incision half an inch long into the uncontracted urethra in front of the stricture, then insinuating a small grooved probe through the constriction, and finally dividing thoroughly the stricture, together with a quarter of an inch of the urethra behind it, with a delicate sharp-pointed bistoury guided by the groove in the probe. I then incised the anterior stricture with a straight probe-pointed bistoury, and introduced a full-sized steel sound into the bladder. No catheter was retained, and the patient had no urethral fever and no untoward symptoms whatever.

A No. 14 steel sound was introduced every third day for the month following the operation, and the patient was then discharged from the hospital, as his wound had entirely healed. I visited him, however, two months afterward, and passed upon him without difficulty the same sized instrument.

CASE III.—*Impassable stricture of eleven years' standing, from gonorrhœa—Chronic cystitis, with dribbling of urine from over distension—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.*

W. J., æt. 49, intemperate, was admitted to Bellevue Hospital on March 28, 1864, suffering from constitutional syphilis, which evidenced itself chiefly in tibial periostitis. He made no complaint of urethral disease until April 22d following, when his great difficulty in urination compelled him to seek relief therefor. The patient stated that he first contracted gonorrhœa when 19 years old, and that there were several repetitions of the infection during the ensuing thirteen years; but that none of these occasioned any stricture. At this time, however, when 32 years old, he had a sexual connection which resulted in the double

poisoning of gonorrhœa and syphilis. Another year passing by gave him unmistakable evidences of stricture of the urethra; but its growth was so slow that not until eleven years thereafter, in his 44th year, was his difficulty in micturition so great as to lead him to seek surgical aid. Bougies were at that time passed, apparently without much benefit. For the last four years he had made a very small stream, but without pain, and at no time had there been complete retention; but he at last urinated *guttatim*, and passed a great deal of mucus.

Urethral examination revealed four distinct strictures in the spongy portion, three of which were passed without much difficulty; but the fourth, situated in the region of the bulb, was too tight to admit the smallest flexible bougie.

Careful attempts were made to dilate his strictures, but without the least success, as the last one still remained impassable. It was therefore decided, in view of the patient's age, of the duration of his disease, and of his liability at any moment to complete retention, extravasation, and all the attendant evils, to relieve him by the external division of his stricture. The patient was accordingly etherized, and the operation performed, by freely incising the skin and making a small opening into the healthy urethra in front of the stricture, upon the end of a grooved staff, opened at the extremity, then introducing a delicate probe-pointed director through the constricted urethra, and finally dividing freely all the diseased portions with a sharp-pointed bistoury, guided by the director, the incision involving, both before and behind, a quarter of an inch of the uncontracted canal. No catheter was left in, but a No. 14 steel sound was passed every second day.

The patient had no urethral fever, the wound healed kindly, and he was discharged in about a month, with the advice to use an instrument once a week through life.

REMARKS.—The point of interest in this case was the rapid subsidence of the cystitis after free flow was given to the urine. Severe cystitis, instead of being a contraindication to the operation, will, in the majority of cases, be relieved soon after its performance, unless there happens to be disorganization of the coats of the bladder or advanced disease of the ureters and kidneys. I have observed this rapid alleviation of cystitis in several cases,

and feel satisfied that early operative interference will seldom fail to bring about this much-desired result.

I have never known cystitis to follow the operation, except in cases where a catheter had been tied in position.

In the case under consideration, no catheter was left in the bladder, and no unfavorable symptoms occurred from the passage of the urine upon the recently-cut surfaces. Nor was union of the perineal wound in the least retarded.

CASE IV.—*Impassable stricture from gonorrhœa—"Perineal section" in 1860—Catheter retained four months—Relapse—Cystitis—Stricture again impassable in 1864—External perineal urethrotomy without conductor—Catheter retained forty-eight hours—Aggravation of cystitis—Urethral fever—Large instruments subsequently introduced—Good result.*

For the details of this case see page 129.

CASE V.—*Old impassable stricture—Threatened retention—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.*

L. M., æt. 33, a colored sailor, of intemperate habits, was admitted to the Seamen's Retreat on February 5, 1867, suffering from an impassable stricture of the urethra of several years' standing. The origin of his difficulty was involved in obscurity, as he utterly denied ever having had gonorrhœa, or having received any injury to his perinæum or urethra.

Several prolonged but unsuccessful attempts were made to introduce bougies, while the patient was under the relaxing influence of ether.

In the latter part of May following, I was requested by Dr. T. C. Moffat, Surgeon to the Retreat, to see the man with him. An exploration with bulbous bougies revealed a permeable stricture just within the meatus, and a second very tight constriction five inches from the external orifice, through which, with the most careful effort, I failed to introduce my finest whalebone bougie. In view of impending retention, I advised external division, and at the Doctor's request proceeded to perform the operation.

No guide could be introduced, though the attempt was repeated and prolonged; I therefore opened the urethra in front of the stricture upon the end of a tunnelled and grooved staff; then, after careful manipulation, succeeded in engaging a fine grooved probe in the almost obliterated urethra, and guided by this I divided the stricture very freely, carrying the incision through about a quarter of an inch of the uncontracted canal behind. The meatus was then thoroughly divided, and a full-sized steel sound passed into the bladder. Finally, on removing the sound, I completely emptied his bladder by means of a female catheter introduced through the perineal wound. No catheter was retained.

The patient had no chill or fever, and passed his water freely, partly through the wound, partly through the urethra, and a No. 12 steel sound was introduced every second day until the 22d of June, when the wound was entirely healed, about one month after the operation; and he was discharged, able to make a stream of urine of normal size, and promising to continue the use of the sound.

CASE VI.—*Impassable stricture from gonorrhœa—Retention of urine—External perineal urethrotomy without conductor—No catheter retained—No chill or fever—Good result.*

Edward P., æt. 36, admitted to Bellevue Hospital, July 1, 1869. Gonorrhœa fifteen years before, aggravated by excess. Gleet. Four or five years after, the stream of urine got smaller, became spiral and feeble. Pains in the loins, dysury and rigors. These symptoms always increased in severity after hard drinking and exposure. He remained in this condition, sometimes better, then worse, until June 25, 1869, when his urine began to flow *guttatim*. On June 29th he had a retention, which was partially relieved by a hot hip-bath. On the next day, Dr. De Long, of Brooklyn, brought him to me, and I endeavored to introduce a capillary bougie, but failed, and sent him to the hospital. He then had retention of urine, a few drops only dribbling away from overflow. Some morphia and tincture of chloride of iron and a diluent of citrate of potash were administered, and gave him relief, but he was still unable to pass a stream of urine. The obstacle being insurmountable, it was concluded to resort at once to external division, to empty the bladder completely and ward off extravasation.

Operation, July 2, 1869.—Perinæum shaved. Exploration with bulbous bougie discovers the main obstruction to be four and a half inches from the external orifice. Urethra filled with oil, and further exploration made with capillary spiral bougies, but none entered the stricture. Patient etherized. Grooved and tunnelled catheter staff introduced to the face of the stricture and held in position by Dr. George A. Peters, who kindly assisted me. Patient placed in the lithotomy position. Incision in the median line, three inches long, reaching to half an inch of the anus, involving the skin and superficial fascia. With successive cuts the urethra was laid bare, and the groove of the staff could be felt with the finger-nail through the coats of the urethra; the canal was then freely laid open. Two loops of silk were passed through the edges of the mucous membrane close to the obstruction, and a third at the anterior angle of the urethral wound. Moderate traction upon the strings exposed well the interior of the canal, and the orifice of the stricture was readily found, and a minute grooved probe passed through, and the constriction completely divided longitudinally with my small beaked bistoury. A broad grooved director being substituted for the probe, the catheter staff was by this means conducted into the bladder, the urine drawn off and the instrument removed. The urethral incision was two inches in length. After division of the meatus, a No. 12 sound was passed into the bladder. Hæmorrhage five ounces. As there was still some oozing, the wound was filled with picked lint with good effect. Quinine, ten grains. No catheter retained; no chill or fever.

July 3.—Some infiltration of urine in the superficial layers of the perinæum and scrotum, due to neglect in supporting the scrotum, and also to the presence of the lint, which was at once removed, giving free issue to the urine. The scrotum was then placed in a proper sling. No. 10 sound.

July 10.—Has suffered no ill effects from the infiltration. Wound covered with healthy granulations. The patient up and walking about.

August 25.—No. 12 sound was first passed every second day, and then once a week. The perineal wound was so far healed that no urine escaped through it. He made a good stream of urine at normal intervals, and was in excellent health. At his urgent request he was discharged. I have not since seen him, but Dr. De Long tells me that he is still (1872) in good condition.

CASE VII.—*Impassable stricture of twelve years' standing, from gonorrhœa—Perineal fistula—Constant dribbling—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.*

R. M., æt. 36, of intemperate habits, was, on the 3d day of June, 1866, an inmate of the Seamen's Retreat, in charge of Dr. T. C. Moffat. The patient stated that he first had gonorrhœa in 1852, since which he had never been entirely free from gleet, and that he contracted "a fresh clap" each time that he subsequently indulged in the sexual act. In 1854 he began to notice a diminution in the size and force of his stream, and an increase in the number of his calls to pass water. Though this difficulty was progressive, he underwent no treatment until 1859, when he entered the New York Hospital for the relief of both constitutional syphilis and stricture of the urethra. The constriction was so tight that the House Surgeon could only succeed in introducing a No. 1 flexible bougie, and this operation was repeated daily, with no advance, during the two months that he remained in hospital; and he was finally discharged relieved of his syphilis, but still troubled with the stricture. He soon after shipped for China, and while on the voyage had a retention which, being unrelieved, resulted in rupture of the urethra and extravasation of urine, and at last in perineal and scrotal fistulæ, through which urine continually dribbled.

Till within two weeks of our first interview the patient had passed no water through the urethra in front of the stricture, but during that time he had been able to pass a portion of his urine through the natural channel.

At the request of Dr. Moffat I proceeded to explore the patient's urethra. A bulbous bougie of moderate size was obstructed in its passage at a point two lines within the meatus; but slight pressure carried it on, to encounter a second stricture one inch and a half behind; and finally an unyielding constriction was met, five and a half inches back, which would not admit the finest filiform bougie. The whole urethral canal down to this point was inelastic and indurated.

I advised rest for a few days, and also warm baths and diluents, then another cautious trial with small flexible instruments.

Two weeks afterward, on the 17th of June, I again saw this patient, and learned that several attempts had been made by Drs. Moffat and Feeney to introduce small instruments into his bladder, but without success. I repeated the trial with the smallest whalebone bougies, but failed to get beyond five and a half inches.

In view, then, of the failure of these efforts, and of the wretched condition of the patient, who by the constant dribbling of urine through the fistulæ and the consequent irritation of his scrotum and thighs was entirely incapacitated for work, as well as of the liability of serious aggravation of his troubles, I advised external perineal urethrotomy, in order to make a radical cure of both fistulæ and strictures. This advice was accepted by Dr. Moffat, and at his invitation I performed the operation.

The patient having been etherized, and placed in the lithotomy position, I made still another attempt to pass a filiform guide into the bladder, but again failed after the most gentle and careful manipulations. I then passed down to the perineal stricture a small grooved staff, which, held in position by Dr. Moffat, aided me, after I had made the usual incision in the median line of the perinæum, in opening the urethra anteriorly to the stricture. After a few minutes' search I found the orifice of the stricture, and passed through it a delicate grooved probe, and upon it freely divided all the constricted portion—occupying nearly the whole length of the bulb, which was indurated, glistening, and bloodless—and involved in my incision a quarter of an inch of the urethra behind. I could then pass my index-finger into the membranous portion of the urethra, which I did to satisfy myself of the completeness of the division. I then passed through the wound a female catheter, and drew from the bladder over a pint of urine.

With Civiale's "*bistouri caché*" I then divided the two anterior strictures, and introduced a No. 13 steel sound into the bladder, meeting another obstruction about four inches from the meatus and passing it with moderate pressure. The whole canal was unyielding and leathery. No catheter was retained.

He had no chill, and no urethral fever, and in two weeks was able to be up, and walk in the garden. No. 13 steel sound was introduced every second day. The wound healed in about five weeks, but the patient remained at the Retreat until the 1st of November following, when he had learned to pass his own instrument, and was making a normal stream of urine.

CASE VIII.—*Impassable stricture from gonorrhœa—Urinary fistulæ—Dribbling from overflow—External perineal urethrotomy without conductor—No catheter retained—No chill or fever—Good result.*

Richard N., æt. 37, admitted to Bellevue Hospital, September 16th,

1869; had gonorrhœa followed by gleet in 1848, and peri-urethral abscess, opening spontaneously and healing completely, in 1850. In 1857 micturition was frequent, with small stream, and finally he had dribbling from overflow, and in 1860, after a debauch, complete retention for twelve hours, relieved by the catheter. His trouble was always aggravated by excesses. On July 1st, 1869, after having had partial retention, an abscess appeared in the perinæum, and opened spontaneously on the 25th, giving issue to urine as well as pus, and remaining open as a urinary fistula. Another abscess appeared over the left tuber ischii.

He had a linear stricture, admitting No. 7½, four and a half inches down, and another very dense stricture an inch beyond, through which I failed to pass the smallest bougies, after most diligent and prolonged efforts. I then concluded to make external division of the stricture.

On September 18th, the patient being etherized, the urethra was laid open in front of the obstruction upon the point of a tunnelled and grooved catheter-staff resting against the face of the obstruction; then the orifice of the stricture brought into view, and entered by a small grooved probe, which served to guide the point of the narrow-beaked bistoury with which the whole stricture was divided. A whale-bone guide was then passed into the bladder upon the groove of the probe, the free end engaged in the tunnel of the staff, and the latter instrument slid upon its conductor into the bladder and urine drawn.

The operation was completed in fifteen minutes, with a loss of blood not exceeding half an ounce. Ten grains of quinine were given; no catheter retained, and there was no chill or fever. Meatus enlarged to No. 16 on the next day (for description of the operation and condition of external urethral orifice, see Chapter VI. and Fig. 40), and No. 14 sound passed into the bladder.

September 29th.—Small abscess by the side of perineal wound incised so as to make a common opening to the fistula and the perineal wound. No. 14 sound.

November 1st.—Perineal wound nearly closed, and very little urine comes through.

January 4, 1870.—The patient is now in good health, and is about to resume his occupation of baker. The wound is healed, but there is still a narrow fistulous orifice through which urine occasionally drops. No. 13 sound has been passed every third day.

CASE IX. *Impassable stricture from gonorrhœa—Twenty urinary fistulæ—Chronic cystitis—Dysury—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.*

Chs. N. L., aged 28, temperate, sent to me by Drs. Barbour and Lockwood, of Norwalk, Conn. He was admitted to Bellevue Hospital on December 29, 1869.

The patient had gonorrhœa twelve years before. No gleet. In eight months he noticed a marked diminution in the size of his urinary stream, with dysury and much straining. Four or five weeks later he had a complete retention, which, in the course of twelve hours, was relieved spontaneously. Before the ischuria he had a perineal abscess, which broke in four or five days, urine coming through. The resulting fistula remained patent. He never had a second retention, but small abscesses formed from time to time in the perinæum, scrotum, upper and inner parts of the thighs, and in the hypogastric region, to the number of twenty, and broke and healed without giving issue to urine, with the exception of the first (in the perinæum), and of another in the upper and inner part of the left thigh. Twelve of the fistulæ were still patent on the day of his admission. One fistulous opening was situated a little to the left of the peno-scrotal junction, with much puckering and induration of the parts. He felt well, aside from his urinary trouble, and, with the exception of irregular chills, to which he had been subject for four years, he had no untoward symptoms. His principal complaints were about the fistulæ, cystitis, and dysury, which latter trouble was on the increase.

Exploration was hindered by a stricture one-third of an inch from the external orifice, admitting only No. 5. After free division of this obstruction, No. 8½ bulbous bougie was introduced, and arrested four inches back. No. 6½ met, at five inches, a stricture through which no instrument could be made to pass. A capillary bougie constantly emerged at the fistula in the upper part of the left thigh, showing the urethral orifice of this fistula to be between the two strictures.

Viewing the case as one not amenable to the simpler methods of treatment, I advised external division of the strictures with free incision of the fistulæ in the scrotum and perinæum, and on January 8, 1870, proceeded to execute the operation as follows:—Another prolonged but fruitless trial was made with capillary bougies. The patient was then etherized, placed in the lithotomy position, a catheter-staff passed

down four inches and held in position by an assistant. An incision was then made in the median line, from the peno-scrotal junction to within half an inch of the anus, the scrotum bisected, the two testicles, with their coverings uninjured, held aside, the urethra opened upon the groove at the extremity of the staff, the edges held asunder by means of loops of silk, and after a little search the orifice of the first stricture brought to view, and a fine grooved probe passed through both constrictions, and free division made with a beaked bistoury. Thompson's probe-pointed catheter, straightened, was passed through the perineal wound into the bladder, and a little urine flowed. Being now sure of having gone in the right direction, a broad-grooved director was substituted for the small catheter, the catheter-staff was then conducted into the bladder and half a pint of purulent urine drawn off. The puckered skin of the scrotum was afterwards dissected up and slid over to the median line, and fine silken sutures applied from this point for two and a half inches back, but the perineal wound was left open to heal by granulation. No catheter was retained. Three hours after the operation he had a slight rigor, but none subsequently. In the evening the urine was drawn off by means of a gum-catheter passed through the wound. Ten grains of quinine were given.

January 20th.—The whole scrotal wound has healed, all the fistulae are closing, and urine comes only through the perineal wound, which is covered with healthy granulations. There has been no inflammation of the testicles. No. 10 sound has been passed twice a week.

February 2d.—The patient has been up and about for a week, and has experienced great relief since the operation. He urinates four times during the day, but is disturbed five or six times at night by the desire to relieve himself. He is discharged at his own request.

CASE X.—*Narrow, unyielding stricture of several years' standing from gonorrhœa—Very frequent and painful micturition—Dribbling from overflow—Perineal abscess—External perineal urethrotomy with conductor—No catheter retained—No urethral fever—Good result.*

J. M., æt. 45, was first seen by me on June 7, 1867, in consultation with Dr. A. Arango. The patient had been suffering from stricture of the urethra for five years, the consequence of several gonorrhœas, but had never been subjected to treatment until he placed himself under the care of Dr. Arango. The doctor tried dilatation for some time, and then requested me to see him.

I found Mr. M. suffering much from over-distension of the bladder; having a constant desire to micturate, and yet able, even with much straining, to pass only a small quantity of urine, and that drop by drop. Occasionally his water dribbled away from him involuntarily.

An exploration with a No. 10 bulbous bougie revealed a contraction just within the external meatus, and a second five and three-quarter inches back, which would not admit a No. $\frac{1}{4}$ whalebone bougie. The whole urethra was extremely sensitive and intolerant of instruments.

I advised rest for a few days, with the free use of diluents, and a daily warm hip-bath, and that a further attempt at dilatation be made. This course was pursued by Dr. Arango, but at the expiration of a week all the symptoms were so much aggravated that this method of treatment was no longer admissible. At the Doctor's request I took charge of the case, and seeing the patient on June 15th, found his perinæum hot, swollen, tender, and fluctuating. Further delay would, I thought, only result in extravasation of urine, and I therefore advised him to submit to external perineal urethrotomy, as at once the safest and most speedy method of giving him both present and permanent relief. To this course he consented, and I sent him immediately to St. Vincent's Hospital, and on the same day performed the operation as follows: The patient having been etherized and placed in the lithotomy position, the urethra was filled with warm oil, and a whalebone bougie, No. $\frac{1}{4}$, was introduced into the bladder. A grooved staff was then passed down to the obstruction, and held in position by an assistant. The usual external perineal incision was made, giving exit to a considerable quantity of pus, and the urethra opened upon the point of the staff. A fine-grooved probe was now passed through the constricted canal by the whalebone guide, and the stricture freely divided, the incision including a little uncontracted urethra behind. The stricture just within the meatus was then deeply incised with Civiale's "*bistouri caché*," and No. 17 conical steel sound introduced with ease into the bladder. No catheter was retained.

During the first twenty-four hours the urine passed partly through the wound and partly through the urethra; but from that time not a drop escaped through the wound, and it completely healed in the course of three weeks. The patient was entirely free from urethral fever and any untoward symptom. He was up in a week, and left the Hospital on June 30th, fifteen days after the operation.

Mr. M. called to see me in the ensuing month, and passed upon him-

self a No. 15 steel sound, and promised to repeat the operation once a week through life. In October he was reported by Dr. Arango to be enjoying excellent health, and to be passing a good stream of urine.

CASE XI.—*Stricture of six years' standing, from gonorrhœa—Perineal fistula—Repeated retentions—External perineal urethrotomy (Mr. Syme's method)—Death fifty-six hours after the operation, probably from thrombosis of the heart—No autopsy.*

H. F., aged 23, a bar-tender, of intemperate habits, was admitted to Bellevue Hospital on September 27th, 1867, suffering from stricture of the urethra and perineal fistula.

The patient stated that he contracted gonorrhœa for the first time at the age of 16, and suffered for a long time from gleet. In a year he began to notice symptoms of stricture. Soon after this he had retention of urine, and a swelling formed in the perinæum which increased in size, became very painful, and finally opened spontaneously and discharged pus and urine. The fistulous tract thus formed continued open, and allowed urine to dribble through it for three months; but it then completely healed, and the patient experienced a recurrence of the graver symptoms of stricture, which had seemed to diminish while the fistula remained open, even to the extent of an enlarged stream of urine through the natural passage. At the age of 19 he contracted a second gonorrhœa, again followed by gleet, and still further aggravating all his symptoms. The consequence was another retention and perineal abscess—this time exceedingly painful, and evacuated by the surgeon's knife—and another fistula, which remained open for two months. In two years more—that is, two years since—the same accident occurred, after a debauch, and the ensuing fistula has never healed; there have consequently been no more abscesses, but several times, after drunken spree, he has had retention.

On exploration with a No. 10 bulbous bougie the whole urethra was found quite sensitive, and the instrument was arrested three and five-eighths inches back; a No. 2 passed this obstruction to be itself stopped four inches from the meatus.

A careful examination of the urine gave no evidence of bladder or kidney disease, and so far as could be discovered the patient was free from all lesion except a syphilitic taint, as evinced by copper-colored scars on the limbs and some lingering nocturnal rheumatism.

Upon consultation it was decided that external perineal urethrotomy

was indicated, as at once the best cure of his stricture and of his fistula. Accordingly, on October 19, 1867, the patient was etherized, and I performed the operation after the method of Mr. Syme. Nos. 12, 13, 14, and 15 steel sounds were successively introduced with great care and gentleness, to make sure that the incision of the urethra had been sufficiently free. The bladder was then emptied by means of a female catheter passed through the wound. No catheter was retained. No serious difficulties presented themselves, and the patient was not over fifteen minutes upon the operating table. He recovered readily from the effects of the anæsthetic, and from the shock of the operation, having lost not more than two ounces of blood.

When seen in the evening the patient was suffering from some febrile reaction, with a pulse of one hundred, and he said that he had had a chill. On the following morning he was quite comfortable, having passed water freely, partly through the urethra and partly through the perineal wound, and having no pain. His pulse was not noteworthy, except for its rapidity, being a little over one hundred. In the same afternoon his heart's action became suddenly very rapid and very feeble, and his breathing labored. Under a liberal use of stimulants he rallied somewhat, but when seen on the next morning he presented the appearance of a patient in the collapse of cholera, and, though perfectly sensible, complained of no pain. His pulse was extremely feeble, and so rapid that it could not be counted. He had lost no blood since the operation, and had no vomiting, no delirium, and no suppression of urine at any time. Warmth was applied to his surface, and stimulants and nourishment administered both by mouth and rectum, but there was no reaction, and the patient died at 10 P.M., on October 21, fifty-six hours after the operation. No autopsy could be obtained.

REMARKS.—There might have been morbid conditions of the viscera which had escaped observation during life, but the doubt could not be cleared, as the relatives of the deceased strenuously objected to an autopsy. I could discover nothing, however, before the operation which I thought contra-indicated it. I am always in the habit of examining patients very thoroughly before ever subjecting them to the risks of such an operation. This man's thoracic and abdominal organs had been

explored with the greatest care, and his urine examined microscopically, and found normal so far as regarded renal affection. I could see no reason, at the time of the operation, why this case should not have progressed to a favorable termination. I consider the probable cause of death to have been thrombosis of the heart. The syphilitic cachexia might have been the predisposing cause of this. Fatal cases seem to be those which present the least complications and difficulties in the operation, and in which there seems to be no contra-indication. This would appear to be the experience of many lithotomists and urethrotomists. It is, in fact, the experience of many in other departments of surgery. Mr. Reybard, in his treatise on stricture of the urethra, Paris, 1853, page 401, mentions having seen several cases where death occurred within twenty-four hours after one sitting at catheterism.

Professor Velpeau also relates five or six cases of death after mere catheterism (*Leçons Orales de Clinique Chirurgicale*, etc., Paris, 1841, pp. 326 and 327). One case was that of a healthy young man, who was seized with a violent chill on the evening after the introduction of a delicate bougie, and on the following day "tetanic symptoms" manifested themselves, and in twenty-four hours after the occurrence of the chill he died. At the autopsy nothing was found to account for these fatal symptoms. The urinary organs presented no morbid changes.

Another patient presented himself at the Hôpital de la Charité, and on the day following his admission he was catheterized. In the evening he had violent chills, and on the next day his surface was found cold, livid, as if seized with choleraic symptoms. He died at the end of forty-eight hours. Nothing but pulmonary congestion was found at the autopsy.

This case bears a considerable resemblance in its symptoms to that of II. F.

The absence of suppression of urine in H. F.'s case makes the diagnosis of thrombosis highly probable, and the same accident might have occurred after even a less severe operation than the one performed.

CASE XII.—*Retention and extravasation of urine from a stricture of three years' standing from gonorrhœa—External perineal urethrotomy with a conductor—No catheter retained—No urethral fever—Good result.*

G. D., æt. 35, of intemperate habits, was admitted to Bellevue Hospital on April 27, 1866, suffering from stricture of the urethra and partial retention of urine. He stated that three years before, while serving in the army, he contracted at the same time syphilis and gonorrhœa; the latter degenerated into a gleet, which continued an indefinite time. Three months from the period of infection he had a retention, lasting twenty-four hours, from which he was relieved by the catheter, one pint and a half of urine being drawn off. From that time he was not subjected to any treatment; but his symptoms so gradually grew worse that he did not notice a diminution in the size of his stream until six months ago; a week before his entrance into hospital he began to pass his water only by drops, and with great difficulty.

On April 30th I found him suffering from complete retention, which had lasted twenty-six hours, with a tumefied, hot, tender, and fluctuating perinæum, and with an enormously swollen scrotum.

With the patient's consent I proceeded at once to perform external perineal urethrotomy. A filiform flexible bougie was introduced through the stricture into the bladder, and a grooved staff passed down by its side to the face of the constriction, which was seated in the region of the bulb. The incision in the mesial line was made from the scrotum to within three-fourths of an inch of the margin of the anus, and the abscess thereby laid completely open. After thoroughly cleansing its cavity, removing the sloughs of connective tissue which it contained, I incised the urethra upon the end of the staff, about half an inch in front of the stricture, and then divided the contracted portion, together with half an inch of the canal beyond—in all nearly two inches. About one pint of urine flowed on the completion of the incision. Afterwards I incised thoroughly a stricture four lines within the meatus, and then introduced successively Nos. 12, 13, and 14 steel sounds. The whole

canal, from the meatus to the perineal stricture, was very much indurated and unyielding. No catheter was retained.

The patient had no chill, or urethral fever. Nos. 12 and 13 steel sounds were daily introduced; the urethra became more and more elastic, and at the end of four weeks he was discharged from the hospital with his perineal wound nearly healed; a few drops of urine still flowing from it at each micturition.

May 28, 1866.—He urinates twice during the night, but only four times in the day. Nos. 14 and 15 steel sounds are introduced, and No. 15 is ordered to be passed every other day.

July 28th.—The perineal wound healed completely shortly after I last saw the patient, and he has not since experienced the slightest trouble with his urinary organs. He introduces No. 15 steel sound once a week, without pain or difficulty, and is pursuing his occupation.

August 24th.—I introduced, to-day, No. 15, without using the slightest force, and neither introduction nor withdrawal gave the least pain.

May 1, 1867.—The patient calls upon me to report himself quite well, passing a good stream, and still using his No. 15 steel sound.

The patient was heard from in July, 1872, was in good health, still using his sound once a week, and passing a good stream of urine at normal intervals.

CASE XIII.—Retention and extravasation of urine from a stricture of three years' standing, from gonorrhœa—External perineal urethrotomy with conductor—No catheter retained—No urethral fever—Death forty-six days afterwards from advanced disease of the bladder and kidneys.

J. McD., aged 28, of intemperate habits, was admitted to Bellevue Hospital on August 21, 1866, suffering from rupture of the urethra and extravasation of urine.

The patient's account of himself was, that four years before he had contracted a gonorrhœa, which was cured in four weeks. A year afterwards he had another attack of the same disease, and early in its course noticed a diminution in the size of his stream of urine, which became rapidly more marked, so that when cured of his gonorrhœa—at the end of six weeks—he passed a stream “about the size of a knitting-needle.” He, however, experienced no great difficulty in micturition for two and a half years, that is, until six months before his entrance into hospital,

but at that time he had a retention, which was relieved spontaneously. Three months later he again suffered from ischury, and was relieved in the same manner. Three days before admission he was for the third time seized with "a stoppage of his water." He indulged in most violent efforts at straining, in order to relieve himself, and during one of them felt something give way, at the same time experiencing a sensation of nausea and faintness. A physician was immediately sent for, but before he arrived the scrotum and penis commenced to swell. The doctor endeavored to pass an instrument, but failed, and advised the man to go to a hospital. Before leaving home the urine began to dribble away, and with a great deal of effort he could pass an exceedingly small stream.

When admitted to the hospital his scrotum and penis were enormously swollen and œdematous—there being complete phimosis from infiltration of the prepuce—and the perinæum was hot, swollen, and tense. Urine was continually dribbling from the meatus, but his bladder was greatly distended, reaching nearly the umbilicus. His tongue was dry and brown, skin hot, pulse 100, and he complained of severe pain in the back.

An effort was immediately made by the house surgeon to introduce instruments, but after many attempts with the smallest sized bougies, he found it impossible to pass a firm stricture five and a half inches from the meatus. A hot bath and a dose of morphia were ordered.

I first saw the patient on the next day, August 22d, and, after reviewing his previous history and his immediate symptoms, concluded to give him the benefit of external perineal urethrotomy, though his condition was anything but promising. The man was accordingly etherized and placed in position, and I succeeded in introducing a whalebone filiform bougie through the stricture, and passed down by its side, as far as the seat of obstruction, a small-grooved staff. The perineal incision was carried to the bulbous urethra; the sloughy tissue, pus, and urine which surrounded it were sponged out, and the canal opened upon the end of the staff. The substance of the bulb was found remarkably dense, indurated and bloodless. A small-grooved probe, introduced through the wound, was then guided by the bougie, passed through the constricted canal, and upon it the stricture was freely divided. The phimosis was relieved by making punctures with a bistoury. Urine flowed freely through the perineal wound, and the evacuation was completed by the aid of a flexible catheter. After this I introduced into the bladder

through the whole length of the urethra a No. 12 steel sound, which met with considerable obstruction from the indurated condition of the walls of the canal. Larger instruments, up to No. 18, were successively and gradually substituted. The patient was then placed in bed, water dressings applied, and half an ounce of brandy containing a quarter of a grain of morphia administered. No catheter was retained.

August 23d.—Pulse one hundred and feeble, and tongue dry and brown. Strong beef-tea, with brandy, ordered. The wound looked well, and the urine was passing freely through it. The swelling of both penis and scrotum very much reduced. No. 12 steel sound.

August 25th.—The scrotum and penis presented a gangrenous appearance. Free incisions made to relieve the remaining tension, and a yeast poultice applied. After careful examination pyelitis as well as cystitis discovered. Quinine and iron in addition to the beef-tea and brandy.

August 27th.—The slough upon the scrotum had separated, and the exposed surface looked healthy, but that upon the penis seemed to be still extending. Perineal wound clean, urine passing freely through it.

September 3d.—The slough upon the penis had extended into the urethra, so that the sound, instead of entering the bladder, came out in front of the scrotum.

September 5th.—The slough separated, leaving an opening one inch long in the lower wall of the urethra anterior to the scrotum. Stimulating dressings. The patient's appetite very poor, and his strength fast failing. He complained much of pain in the back over the region of the kidneys.

September 26th.—Perineal wound nearly healed. Urine passed through the opening in front of the scrotum, over a healthy granulating surface. Urine obtained by the catheter found loaded with pus.

October 7th.—The patient continued slowly to sink without any marked change in his symptoms, and at 8 o'clock in the morning he died.

AUTOPSY.—The opening in the urethral floor above described was found uncontracted, but the perineal wound had nearly entirely cicatrized. The bladder contained about eight ounces of a fetid, dark, viscous fluid, consisting of alkaline urine and pus; while its walls were hypertrophied to the extent of half an inch, and its mucous membrane was thickened, chocolate-colored, and covered with shreds of lymph.

The pelvis of the kidneys and the ureters were dilated, the latter to the size of the index-finger, and filled with dark-colored viscous pus.

The kidneys were enlarged to nearly three times their proper size, the left being a little the larger.

The other abdominal viscera were healthy, also those of the thorax.

REMARKS.—Although this case was very unpromising, and one of the kind where the operation is usually contra-indicated, the emergency was such as to warrant interference with a view to give free flow to the extravasated urine, and also to relieve the bladder. Usually, in cases of extravasation, the surgeon is content with making free incisions as outlets for the extravasated urine; but I believe it is good surgery to divide the stricture at the same time.

CASE XIV.—*Large perineal fistula from loss of substance due to rupture of the urethra and extravasation of urine from stricture—External perineal urethrotomy (Syme's)—No catheter retained—No urethral fever—Good result.*

J. T., 37 years of age, a coachman, of intemperate habits, was admitted to Bellevue Hospital, August 11, 1867.

He had had an attack of gonorrhœa twenty years previously, which was followed by gleet of eight months' duration, but no "trouble with his water" until six months before admission to the hospital, when his urinary stream began to get smaller, and micturition became frequent and prolonged; the urine often dribbling on for some time after. All these symptoms were aggravated by indulgence in drink and by exposure. About three months prior to admission his symptoms grew more alarming, his urine became fetid, ammoniacal, and contained much stringy mucus.

His stream continued to decrease in size until the middle of July, when it almost entirely stopped, and suddenly his perinæum and scrotum began to swell from extravasation of urine. At the time of his admission part of the perinæum and nearly the entire scrotum had sloughed away, leaving the testicles exposed.

On August 14th a No. 12 bougie was introduced into the bladder, but was temporarily arrested in its course by a contraction five and a half inches from the external orifice.

On the 10th of September cicatrization of the parts had progressed to the extent that the testicles were nearly covered; but a considerable

quantity of urine escaped from a large fistulous opening in the perinæum.

From this period a sound was introduced from time to time, but with no good effect until October 7th, when I took charge of the case. The fistulous opening had contracted considerably, but led to a cavity in the centre of the perinæum, capable of containing half an ounce of fluid; out of this, purulent urine was constantly trickling and keeping the parts in a state of excoriation. He had remained in bed ever since his entry into the hospital, and had become emaciated and anæmic, partly from the constant drain upon his system, partly from the confinement. No. 10 bulbous bougie encountered an obstruction five and a half inches back, but passed through.

He was ordered to get up and go out every day for exercise and fresh air, and to take iron and quinine for two or three weeks.

On October 25th he reported himself much better and stronger. The perinæum was, however, more than usually swollen, and the discharge of pus more abundant. The urine came mainly through the natural passage, a little only leaking out of the fistulous opening.

After consultation, it was decided to give him the benefit of external perineal urethrotomy, with the double object of curing the fistula and of relieving the stricture, which showed a tendency to recontract. Accordingly, on the 26th of October, I proceeded to execute the operation after the method of Mr. Syme. The meatus, which admitted no larger instrument than No. 12, was freely incised with Civiale's "bistouri caché," and No. 16 conical steel sound was passed through into the bladder and immediately withdrawn. No catheter was retained.

On November 8th, the twelfth day after the operation, the patient was up and about, and the wound was covered with healthy granulations.

On the 20th of December, Nos. 14 and 15 conical steel sounds were introduced without the slightest difficulty, and gave him but little pain. He had not suffered any untoward symptom and had been free from febrile disturbance. The wound had contracted so as to leave a fistulous opening through which a small probe only could be introduced, but some drops of urine still passed through this. His general health was then good; he had gained fifteen pounds in weight; but micturition was still too frequent.

From January 4, 1868, No. 16 was passed every third or fourth

day, and he was ordered to continue its use at least once a week for an indefinite period.

On January 14th tincture of iodine was injected into the fistulous tract with a view to hasten its closure. This was to be repeated at intervals.

Micturition had become less frequent, and his other symptoms of cystitis had disappeared.

He called at my house on the 18th of January to say that he was again troubled with frequent micturition. This aggravation of his cystitis was due to exposure. He was then passing but three ounces of turbid urine at a time. I advised injection of the bladder with tepid water.

He was last seen by me in April, 1868, in an excellent state of health. The fistulous opening was in a fair way to heal, and but a drop or two of urine escaped, at the close of micturition. He had been passing a normal stream at more regular and longer intervals than before, and had been able, for some time past, to pursue his occupation.

REMARKS.—This man's stricture was probably of much longer standing than he had thought. The progress of the disease was so slow, that the patient was not aware of the nature of his trouble until retention was imminent.

Had he been subjected to the operation at the time retention was impending, he would have been saved much suffering and loss of time, besides the dangers of extravasation.

The risk of the cutting operation is certainly small as compared to the evil consequences of extravasation of urine.

CASE XV.—*Narrow eccentric and tortuous strictures, of thirty years' standing, from gonorrhœa—Frequent retentions of urine—Dysury night and day—External perineal urethrotomy with conductor—Internal urethrotomy—No catheter retained—No urethral fever—Wound healed completely in four weeks—Good result.*

John M., æt. 55, admitted to Bellevue Hospital, January 3, 1872, sent by Dr. W. A. Lockwood. The patient was suffering from stricture of thirty years' standing, the result of several attacks of gonorrhœa. He had had complete retention many times, and was always relieved by

the aid of the catheter, often in his own hands, until four years before admission, when the tightness of the stricture reduced him to dependence upon hot baths. Latterly he had been passing water in very small quantities, and in a very small stream, every fifteen minutes during the day, and eight or nine times at night. Exploration revealed a hard, unyielding stricture, which admitted a No. 2 bulb, half an inch within the meatus, filling the whole fossa navicularis, and having an eccentric orifice near the floor of the canal. Another stricture existed two and a half inches from the meatus (afterwards found to be two inches long), dense, tortuous, and admitting only a spiral whalebone guide. The condition of the bulbous portion of the urethra could only be surmised.

It was determined to keep the patient in bed for a few days, and give him a diluent and large doses of quinine, preparatory to an operation. A retention occurred on the third day, but was relieved by a hip-bath.

On the 10th of January the patient was in a tolerably good condition, and the operation was performed. The stricture, half an inch from the meatus, was freely divided with the meatotome; the second stricture would admit nothing larger than a whalebone guide, which was made to enter the bladder. After several ineffectual attempts to pass the smallest tunnelled sounds, and an abortive effort to perform internal urethrotomy from before backwards, external perineal urethrotomy was decided upon, after consultation with the surgeons present, as the only expedient available. The patient was accordingly placed in the lithotomy position, the perinæum shaved, and the urethra laid open by careful dissection through a small abscess found in its wall, with an external incision two inches long. A silk thread was then attached to each side of the incised urethral wall, to steady and keep open the wound. A small-grooved probe, introduced from behind forwards, guided a knife in the incision of the stricture, and the incision was completed by passing my tunnelled urethrotome over the whalebone guide from the meatus to the perineal wound. A third stricture which was found in the sinus of the bulb was divided with a beaked bistoury upon the groove of a very small director, and a free escape of urine followed the withdrawal of the instrument. Sounds Nos. 12 and 14 were then readily passed the whole length of the urethra and into the bladder. As there was persistent hæmorrhage, a sponge was pressed into the perineal wound and secured by a **T** bandage. The patient was then put into bed, his testicles suspended, to lessen the danger of infiltration of urine, and on his

rallying from the ether a drink of whiskey and water was given him. In the afternoon the sponge was removed to facilitate urination, and, as the hæmorrhage persisted, a Barnes' dilator was introduced in its place with the best effect. This in turn was taken out during the night, and the hæmorrhage did not recur.

The patient convalesced without a single drawback, with the aid of quinine and extra diet; passed his water freely through the wound until the 18th of January, when it began to come also through the urethra in small quantities; and thenceforward he relieved himself in this manner till February 10th, when none escaped by the wound.

The passage of sounds was begun on the 12th of January, with Nos. 8, 10, and 12, in a few days carried up to Nos. 13 and 14, and the same reintroduced every second day. As the patient convalesced the bladder became more tolerant of urine, and he soon ceased to rise more than once during the night to relieve himself, and was satisfied with a natural number of evacuations by day. He was then dismissed, with the advice to continue catheterism once a week for an indefinite time.

He was last heard from in September, 1872, through Dr. Lockwood, who sent me word that though he was negligent in the use of his instrument, he was still in good condition.

CHAPTER VIII.

TRAUMATIC LESIONS OF THE URETHRA.

TRAUMATIC lesions of the urethra deserve especial notice from the fact that the great majority of them are prolific sources of strictures which are extremely painful, often resist the simpler modes of treatment, and are sometimes very difficult to manage.

The term traumatic lesions of the urethra comprises longitudinal rents and incisions; loss of substance; contusions, internal and external; and transverse incised and lacerated wounds from within and from without.

The traumatic lesions of the urethra should be separated into two classes:—1. Those which are not followed by stricture; 2. Those which are followed by stricture.

TRAUMATIC LESIONS OF THE URETHRA WHICH ARE NOT FOLLOWED
BY STRICTURE.

Longitudinal incisions of the urethral walls are not followed by constriction of the canal, neither the oblique wounds practised in lateral lithotomy, nor, it may be added, the rents made in longitudinal divulsion. These facts are now urged because, at one time, longitudinal incisions of the urethra were supposed to cause stricture. If such were the case we would be deprived of some of the most efficient means of treating this disease.

TRAUMATIC LESIONS WHICH ARE FOLLOWED BY STRICTURE.

These should be placed under two heads:—A. Internal injuries; B. External violence.

A.—INTERNAL INJURIES.

1. **The Arrest of Gravel in the Urethra.**—Small calculi expelled by the bladder sometimes linger long enough in the membranous or bulbous portion of the urethra to become deeply embedded in the lower wall of the canal, the flow of urine meanwhile being little if at all interrupted; after a time they may be dislodged and washed away by the stream of urine without being noticed. The parts then heal, leaving a retractile cicatrix proportionate to the amount of loss of substance. The presence of calculi in the urethra is oftener overlooked in children than in adults, and consequently, when stricture occurs from this cause, it is frequently thought to be congenital.* One point of differential diagnosis worthy of remembrance is that congenital stricture is apt to occur at or near the external orifice, while this form of traumatism is usually found in the fixed or pubic curve of the canal.

After the operation of lithotrity, angular fragments sometimes become impacted and cause ulceration, and stricture is the consequence.

2. **Repeated Contusions** by bougies or catheters, roughly used, either at the external orifice or at the bulbo-membranous junction. Examples of this sort of traumatism are met with among patients who sound themselves without due caution, or among old men—suffering from enlarged prostate—who pass worn-out gum catheters every three or four hours.

3. **Transverse Lacerations** in the neighborhood of idiopathic strictures from forced catheterism, or from violently withdraw-

* Sir Everard Home recognized urethral calculi in children as a cause of stricture, and cites the case of a boy six years old who died of stricture caused by a calculus impacted in the urethra. See page 55, vol. 3, *Pract. Observat. on Stricture*, etc. 1821.

ing a bougie which has become knotted behind a narrow stricture.* Laceration may also occur at or near the bulbo-membranous junction, from the unskilful use of lithotriptic instruments; this injury was of more common occurrence when the straight lithotriptors were employed.

4. **The Prolonged Retention of Catheters** in the urethra, used either as a means of treating stricture, or after urethrotomy, and often causing ulceration of the mucous membrane and sometimes perforation of the lower wall of the canal.

5. **Loss of Substance** from gangrene following extravasation of urine in neglected idiopathic stricture. When only a part of the urethral floor has been invaded by the destructive process, an additional stricture (cicatricial) soon forms behind the original constriction with or without fistula; but when the whole circumference of the strictured portion of the urethra sloughs off, or is destroyed in any other way, there ensues occlusion of the canal at the seat of trouble, with one or more fistulae behind, through which all the urine escapes. I have in my possession a carefully dissected preparation—illustrative of complete occlusion of the urethra from loss of substance—consisting of the penis, scrotum and bladder, removed from a man who died in Bellevue Hospital two days after his admission. The following is the history of the case, kindly furnished me by Dr. McBurney, at the time House Surgeon:—

John M., aged 63, admitted December 30th, 1869, in such a feeble condition that he was unable to give a complete account of his complaint. He said that he had had gonorrhœa in 1841; that within four years after he was troubled with dysury, and finally in 1845 that he had complete retention which was relieved by the catheter; that in a few weeks a fistula appeared at the left side of the peno-scrotal junction,

* See Case 6, Chap. V.

from which time—a period of twenty-four years—the urine ceased to flow by the natural route, and escaped entirely by the fistula. To relieve himself he had latterly been in the habit of introducing a catheter through the fistula, but he was too weak to attempt it when he entered the hospital. As no instrument could be passed beyond a point two inches from the meatus, the house-surgeon tried to pass a catheter by the fistula, but failed. Urine dribbled involuntarily by the fistula for two days, and on January 1st, 1870, the patient died comatose.

AUTOPSY.—Both kidneys were in an advanced state of disease, with numerous abscesses. The ureters were much dilated and filled with pus. The bladder was concentrically hypertrophied, and there was chronic inflammation of its mucous membrane. The urethra was completely obliterated from a point two inches within the meatus to the bulbo-membranous junction, where the canal opened into the cavity of a perineal abscess, capable of containing two ounces of fluid (this cavity was practically a supernumerary bladder, and probably the catheter had never gone beyond it), from which urine and pus passed out of the fistulous opening.

6. Caustics.—They are placed last on the list of internal causes, with the view of directing particular attention to their ill effects. At one time they were much employed in the treatment of stricture, principally by John Hunter, Sir Charles Bell, Ducamp, Whateley, Lallemand and Leroy d'Etiolles. The practice is still continued by a few surgeons at home and abroad, but it is to be hoped that the time will soon come when it will be entirely discarded. The application of caustics seems to remove the stricture for the time being, but so soon as cicatrization takes place, there is substituted a very much worse and more inveterate constriction. Mr. Reybard's experiments prove conclusively that one, one and a half, and two grains of pure nitrate of silver applied within the urethra to a circumscribed spot, as would be the case in stricture, causes an eschar involving the thickness of the mucous membrane, and that when cicatrization follows the fall of the slough, the most

obstinate stricture is the result.* The potassa fusa, if employed as a *caustic*, must produce the same effect, but if used in very minute quantity it is neutralized by the urethral mucus and becomes inert. The attempt to cauterize the prostatic portion of the urethra with the solid nitrate of silver in spermatorrhœa, so much resorted to by Lallemand and his adherents, very frequently gives rise to stricture; as the caustic-holder seldom reaches the prostatic sinus, the membranous or the bulbous portion of the urethra is cauterized. I have seen several cases of stricture in the sinus of the bulb from this cause.

B.—LESIONS RESULTING FROM EXTERNAL VIOLENCE.

1. **Transverse Incisions.**—This form of traumatism occurs from amputation of the penis,† and also from accidental incisions. Even when transverse incised wounds heal primarily, stricture ensues. A striking instance of the kind is mentioned by Reybard. A medical man, in a fit of suicidal mania, cut open his larynx with a razor, and then his urethra transversely near the peno-scrotal junction; the parts were brought in apposition and healed primarily. In six months Reybard discovered at the seat of the urethral injury a well-marked stricture, which admitted with difficulty an instrument of five millimetres, No. 7.‡

2. **Lithotomy.**—The experience of ages has demonstrated that the usual careful incisions in perineal lithotomy are not followed by stricture; but certain steps of the operation, if clumsily performed, will surely give rise to this trouble. For instance, the extraction of a large and rough calculus; improper direction

* Reybard, *Traité pratique des rétrécissements du canal de l'urètre*. Paris, 1853, p. 56.

† See Chapter VI.

‡ Reybard, *op. cit.*, pp. 67, 68.

given to the forceps in introduction, or in removing the stone; the use of instruments which cut from before backwards; all of which often cause transverse laceration of the membranous urethra.

In the bilateral or the medio-bilateral operation, which consists of incising the urethra in the median line and of introducing a double-bladed instrument to bisect the prostate, the membranous portion is not always completely cut; in which case there remains a triangular flap of the urethra with its apex looking downward and forward, so that, when union takes place, there is a central cicatricial nodule which, contracting, produces a bridiform stricture, even if there should be no loss of substance; with this complication, however, there follows a still worse constriction. I know of two cases of transverse laceration of the membranous urethra in children, made by the finger used as a dilator in median lithotomy; in both, painful and troublesome stricture ensued. Transverse laceration of the membranous urethra is a much more frequent accident of lithotomy in children than in adults, on account of the delicacy and tenuity of that portion of the urethra in the former. It is almost incredible how little force is requisite to produce this untoward result.

3. **Lacerated Wounds** of the perinæum involving the urethra; fracture of the pubes with injury of the canal by a spicula; gunshot wounds; all give rise to the worst form of cicatricial stricture. The following is a good illustration of stricture from gunshot wound, followed by obliteration of the urethra. The patient, 28 years of age, was admitted to Bellevue Hospital, November 15, 1869. Seven years before he was struck by a fragment of shell, which deeply lacerated the dorsum of the penis to within half an inch of its root; five days after this, it was found necessary, on account of sloughing, to

remove the penis at the point above indicated, leaving a stump only half an inch long, the extremity of which would not heal; meanwhile the urine continued to flow by the natural passage, but in a decreased stream. At the end of six months he was sent to the hospital at Blackwell's Island, where the stump was cankerized in various ways; in five months more it healed, leaving a very narrow outlet for the urine. An abscess then formed in the perinæum, was opened, and gave exit to pus and urine. From

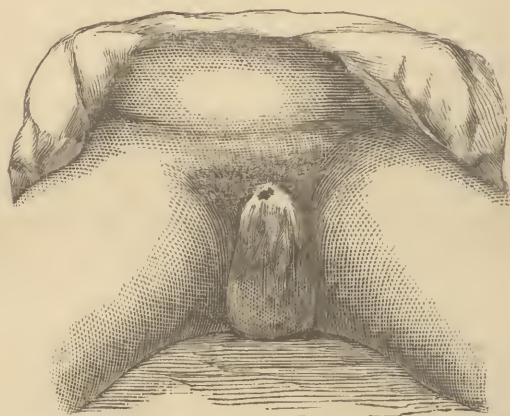


FIG. 48.

that time he passed no water through the meatus, which was completely obliterated, but was obliged to squat down to micturate through the perineal opening. During the succeeding years he had frequent sexual intercourse, but acknowledged that his ejaculations of semen through the perineal opening, though abundant, were premature.

He was admitted to the hospital on account of a phagedenic ulcer of his diminutive penis, resulting from impure sexual commerce; in a short time the remaining half-inch of penis sloughed

away, and the parts cicatrized, leaving the appearance represented in Fig. 48. The scar caused quite an extensive puckering of the scrotum, not unlike a leaf. Fig. 49 shows the scrotum lifted up, and the perineal opening, which resembles the vulva and meatus urinarius of the other sex, and is situated exactly in the median line, three-quarters of an inch in front of the anus. He urinated but three or four times a day, and had no bladder complication. He was then in excellent health, but was troubled with inordinate



FIG. 49.

sexual desires. A few weeks after the complete cicatrization of the phagedenic ulcer, the fellow had the effrontery to contract the marital tie, but his bride ran away on the next day.

4. **Torsion of the Erect Penis.**—This is an injury of somewhat rare occurrence. I have treated only one case of stricture from this cause. See Case XXIX., in this chapter.

5. **Breaking the Chordee.**—This brutal practice, much more common in former times, is still occasionally resorted to under

the supposition that it alleviates the suffering occasioned during erection of the penis in acute urethritis with chordee. The erect and incurvated organ is placed upon a resisting surface, and a sharp blow is administered with the back of a book or the inner edge of the open hand. The result is laceration of the urethra at the seat of trouble, often involving the corpus spongiosum, followed by much hæmorrhage and even sometimes by infiltration of urine. Often very little violence is necessary to rupture the urethra in chordee. Franc mentions the case of a man to whom this accident occurred during erection, while he abruptly turned in bed. A patient came to my notice in March, 1871, suffering from a very dense stricture in the pendulous portion of the urethra, resulting from spontaneous rupture of the chordee during erection.

6. Contusion of the Perinæum.—This is the most common of all the injuries that cause stricture, and is generally produced by falls astride of some resisting body, such as the edge of a board, the wheel of a carriage, the back of a chair, or by a kick. The seat of the injury is usually the bulb, which is forced with more or less violence against the pubic arch. * The *corpus spongiosum* may be simply contused, or interstitial hæmorrhage may take place in its meshes. Obstruction to micturition may arise from bulging of the mucous membrane by a subjacent clot, or the mucous membrane alone may be sharply cut transversely, at or near the bulbo-membranous junction, by the action of the unyielding sub-pubic ligament. From a severe blow or fall the bulb may be crushed, disorganized and converted into a pul-taceous mass, or the canal may be completely severed and the ends retracted. See Case XVI., page 183. The extent of injury to the urethra depends upon the amount of force applied. Desiring to form an approximate idea of the degree of violence to the perinæum requisite to sever the urethra at or near the sub-pubic

curve, I performed a series of experiments* upon the cadaver with the following results:—

The legs and scrotum of a subject having been supported in the lithotomy position, I stood with my back toward the head of the cadaver, with one foot on either side of the trunk, and holding, at a height of four feet, an axe weighing five pounds, let it fall by its own weight, directing the blunt part toward the perinæum; the force of the fall tending to crush the urethra against the pubic arch. After dissection it was ascertained that the canal had sustained a contusion without solution of continuity. A second subject was similarly dealt with, but the axe was raised up to six or seven feet; in this instance, the mucous membrane was sharply cut transversely in the whole circumference of the canal, in the same way that the middle and inner coats of an artery are cut by a ligature, but the spongy tissue had escaped injury other than contusion. A smart blow with the axe—not, however, sufficiently violent to fracture the pubes—in a third subject completely severed the urethra, both ends of which were found retracted about a quarter of an inch. These experiments were several times repeated, with the same results.

The diagnostic signs of the extent of injury to the urethra in contusion of the perinæum are clear and unmistakable. When the violence has been only slight, there is no hæmorrhage, no great amount of smarting during the first act of micturition, no retention of urine. The injury may be followed by a little inflammatory action, which may terminate in resolution or continue and give rise to stricture. When retention of urine follows contusion of the perinæum without urethral hæmorrhage, one may be almost certain that it is owing to bulging of the mucous membrane from an underlying clot of blood. But when there is

* These experiments were done at the suggestion of Dr. Van Buren, in the winter of 1864-5.

urethral hæmorrhage, its amount and duration give some idea of the extent of injury. Slight hæmorrhage indicates that the mucous membrane alone is severed, while profuse bleeding which continues several days makes it highly probable that the rent extends into the spongy body. Another reliable diagnostic sign of solution of continuity is the excruciating pain caused by the passage of urine upon the denuded surface; the larger the denuded surface the greater the pain. Retention of urine seldom takes place if the mucous membrane alone be injured, except when the canal is plugged up by a coagulum. Retention and extravasation of urine almost always occur—unless relief is promptly obtained—in cases where the ends are retracted.

Stricture follows Traumatic Lesions of the urethra just so soon as the injured parts heal. The progress of the disease depends somewhat upon the extent of the injury and its complications. In a case of simple contusion of the urethra, many years may elapse before the constriction is so narrow as to produce serious obstruction to micturition. When the mucous membrane is severed the stricture makes more rapid progress; but when the canal is torn completely across, within six or eight weeks the contraction may be passable to capillary instruments only. Of fifteen cases of injury of the urethra from contusion of the perinæum and from fracture of the pubes—the histories of which are recorded at 183 et seq.—one was followed by stricture in twelve weeks; one in six weeks; two in four weeks; one in three weeks; two in two weeks; two were soon followed by complete obliteration of the urethra at the seat of injury, with perineal fistulæ through which all the urine passed; one (Case XXIV., page 200) was, in the course of years, followed by a narrow and dense stricture, but in this case no statement is made about the occurrence of urethral hæmorrhage at the time of the accident, which happened during childhood, from a fall with one leg

through a hole in the ice,—the injury probably did not amount to more than a simple contusion of the urethra, hence the slow progress of the disease; three old idiopathic strictures aggravated by contusion of the perinæum; one old idiopathic stricture with recent injury; and one old stricture from a traumatism which occurred in childhood, aggravated by gonorrhœa.

Strictures resulting from contusions of the perinæum, or from other severe injuries of the adjacent parts, are extremely irritable, sensitive to catheterism, and prone to bleed at the slightest touch. From the fact that the lacerated tissues usually heal by granulation, there is formed a contractile cicatricial stricture which, in a few months, becomes so dense and unyielding that it resists the simpler modes of treatment, and generally requires free external division and subsequent periodical catheterism with large instruments. (See illustrative cases, 187 et seq.)

“**In the Treatment** of traumatic lesions of the urethra the indications are to relieve retention, thwart extravasation of urine, and prevent stricture. Dilatation and over-distension are absolutely necessary, either as the modes indicated in simple contusion of the urethra, or as after-treatment in severe injuries. In cases of laceration of the urethra, external incision, including half an inch of the canal in front and behind the rent, is, I think, the best and safest method of treatment.” The following account will illustrate the course to be adopted in the management of this class of cases:—

CASE XVI.—*Rupture of the urethra from contusion of the perinæum—Retention of urine—External perineal urethrotomy with conductor.**

Thomas B., aged 33, was admitted to Bellevue Hospital April 10, 1871. This man was suffering partly in consequence of a debauch

* This case was published in the American Journal of Syphilography and Dermatology, October, 1871.

of twenty days' duration, and from the effects of a kick he had received in the perinæum on the day previous to his admission. The injury was followed by a smart hæmorrhage, considerable pain, and by retention of urine. When I saw him (about twenty-four hours after the accident) he was on the verge of delirium tremens; his bladder was distended up to the level of the umbilicus, and he was making violent and painful efforts to relieve himself, but was rewarded by the escape of only a few drops of bloody urine. Several attempts had previously been made to reach his bladder with metallic instruments, with no other result than that of making a tolerably long false passage. The patient was so tremulous, and his urethra had become so sensitive, that it was with the greatest difficulty I could make the necessary exploration. I found the obstruction to the passage of a moderate-sized gum bulbous bougie at five and three-fourths inches from the external orifice. This exploration, though conducted in the most careful and gentle manner, was followed by a gush of blood. I then made several trials with olive-pointed and other gum catheters, large and small, but failed utterly to reach the bladder, and finally had to resort to capillary spiral whalebone instruments, one of which, in half an hour, entered the bladder. Over this delicate bougie I slipped a No. 8 tunnelled gum catheter, through which I drew off two and four-fifths pints of urine. The catheter was then retained in position and the end plugged. The nurse was directed to draw some urine every four hours. Notwithstanding this successful catheterism, I advised external perineal urethrotomy, but, owing to the critical condition of the patient, concluded that it would be more prudent to defer the operation for a couple of days. A hypodermic injection of morphia solution was administered, and he was left for the night.

April 11th.—He has had some sleep; is less tremulous; his pulse is full and regular; he is free from pain, and takes readily a plentiful allowance of milk, beef tea, gruel, and eggs. On removing the plug, urine comes freely away from the catheter.

April 12th.—During the night of the 11th he disarranged the catheter, which could not be replaced by the attendant, and had to be removed; after this the patient was unable to pass his water. It was during my visit at half past one o'clock on the 12th that I became acquainted with what had occurred on the previous night, and, thinking further delay inexpedient, I had the patient at once prepared for the operation. He was thoroughly etherized before I proceeded to cathe-

terism, which was accomplished with very little delay by means of a spiral capillary whalebone bougie as conductor for the tunnelled and grooved catheter-staff. The patient having been placed in the lithotomy position, a free external incision was made, and by successive cuts the urethra was opened longitudinally in the median line from a point half an inch anterior to the injured part, extending as far as the apex of the prostate; the catheter-staff, guided by the capillary bougie, was then introduced into the bladder, and the urine drawn off. The hæmorrhage was inconsiderable. A free outlet for the urine having thus been established, the patient was beyond the danger of infiltration. A careful examination of the parts revealed the extent of the injury: besides extravasation of blood in the surrounding tissues, the bulb was in a pulpy state and torn completely across near its anterior extremity; the ends were retracted and nearly half an inch apart. No. 16 sound was then introduced into the bladder and immediately withdrawn. No catheter retained. After recovering from the effects of the anæsthetic the patient became violently delirious. Twenty-five grains each of hydrate of chloral and bromide of potassium were administered, but without effect. Strait jacket.

April 13th.—Is not so wild, but has still to be confined. Nourishment is freely given, together with four ounces of whiskey daily. Urine passes freely through the perineal wound.

April 14th.—Is better and more quiet, in consequence of having slept last night—under a free dose of chloral and bromide of potassium. Twenty-one grains of quinine three times a day.

April 15th.—Is perfectly rational to-day. Appetite good. Diluent drink ordered. No. 12 sound passed.

April 18th.—Diarrhœa. Perineal wound of a dirty grayish appearance; it is syringed daily with a weak solution of carbolic acid.

May 4th.—Condition of the patient rapidly improving. Sounds of increasing size have been passed every second day. Some urine escapes by meatus. Perineal wound closing.

May 15th.—Nearly all the urine is passed by the natural channel. No. 15 sound.

June 13th.—Sounds to No. 17 have been passed at regular intervals. The perineal wound has for some time been firmly cicatrized. The patient feels well in every respect, and is to-day dismissed, with the injunction never to neglect the weekly introduction of a smoothly-polished No. 16 steel sound.

REMARKS.—The treatment adopted in this case is based upon the following aphorism of Reybard:—"All contusions of the urethra are followed by organic stricture, sooner or later, according to the extent and degree of disorganization."*

This aphorism is the result of extensive experience, and is confirmed by the majority of surgeons who have much to do with this class of cases. Mr. Reybard gives the minutest details of the pathology and treatment of contusions of the urethra in pages 75 to 87 of his treatise, and his arguments in favor of immediate external division of the canal are, to me, very convincing. As, in this case, ordinary catheterism was unsuccessful, puncture of the bladder might have been suggested; but this serious operation would, after all, only have relieved the distended bladder, not the injured urethra, which would have inevitably led to extensive suppuration. The question of puncture of the bladder was not, however, entertained for a moment, since catheterism upon a conductor had been accomplished and had had the desired effect.

The purpose, then, of division of the urethra from without, in this case, was not to relieve a distended bladder, for successful catheterism was the first step of the operation; but the method of treatment employed had for its end:—

1. To give free egress to the urine, and thus obviate the necessity of repeated painful catheterism, or the greater evil of retaining a catheter in the bladder for weeks.

2. To prevent the possibility of infiltration of urine in the

* Reybard, *Traité des rétrécissements du canal de l'urètre*. Paris, 1853, page 86. Reybard's aphorism has lately been popularized in the following happy style by Professor Eugène Boeckel, of Strasbourg, viz.:—"Every transverse rent of the urethra is a stricture in embryo." Professor Boeckel reports an interesting case of rupture of the urethra, where he resorted to the external division at once; but it was done in part for the relief of retention of urine. See *Gazette Médicale de Strasbourg*, 1868.

connective tissue of the perinæum and scrotum, with its consequent sloughing.

3. To allow free escape of the blood extravasated in the corpus spongiosum urethræ.

4. To avert the distressing results that would inevitably ensue from this embryonic stricture.

In cases of narrow strictures, of traumatic origin, at or near the subpubic curve of the urethra, I have no hesitation in recommending external incision of the canal, followed by periodical catheterism, as perhaps the safest and best method of treatment, although I have exceptionally resorted to divulsion and to internal urethrotomy.

The fifteen instances of traumatic stricture treated by external perineal division, recorded below, show thirteen successful results and two deaths.

CASE XVII.—*Traumatic stricture of very rapid formation, from a fall astride of the couplings of railroad cars—External perineal urethrotomy with conductor three months after the injury—No catheter retained—No urethral fever—Good result.*

George S. S., æt. 25, strong and well nourished, admitted to Bellevue Hospital June 5, 1872. About three months before he fell astride the coupling of two railroad cars. Retention of urine ensued, in consequence of plugging of the urethra by clotted blood, and was relieved in ten hours by means of warm water injections,—a number of leech-like clots coming away in the stream of urine. Twelve hours later he was again unable to urinate, and was relieved by a catheter. The urethral hæmorrhage continued for eight or ten days, during which time the catheter (Nos. 6, 7, 8, and 9) was used three times a day, to empty his bladder and make dilatation. In ten days from the date of injury, an abscess formed in the perinæum, opened spontaneously, gave exit to pus and urine, and healed in a few days. While the fistulous opening was patent a catheter was introduced every day and retained for several hours. Elastic bougies were then passed for a week or two, and the patient advised to use them himself twice a week, but neglecting to do so after a short time, he began to suffer from dysury, and soon sought

my advice. On his entry into the hospital I explored his urethra, and found a stricture which would not admit the smallest bulbous bougie, at four inches and seven-eighths from the external orifice. There was a hard nodule in the perinæum, at the seat of injury, in the centre of which a depressed cicatrix was visible.

In consideration of the increasing difficulty of urination, of the density of the stricture and of its rapid contraction so soon after the cessation of dilatation, I advised external perineal urethrotomy as the most expeditious, perhaps the safest, and certainly the most lasting mode of relief. The patient assenting, he was prepared for a few days, and the operation performed on June 13, 1872. Catheterism with a capillary whalebone bougie having been successful, the tunnelled and grooved catheter was introduced, and the other steps of the operation were easy. The bleeding was slight, and there was no subsequent hæmorrhage. After free division of the meatus, which was abnormally narrow, a No. 12 sound was introduced into the bladder, and ten grains of quinine and one grain of opium were given. No catheter was retained, and there ensued no urethral fever. Sounds to No. 14 were passed at regular intervals. The wound healed completely in twenty-three days. The patient was taught to pass his sound, and advised to continue its use, weekly, for an indefinite time.

CASE XVIII.—*Traumatic stricture from a fall astride of a hatchway—Dribbling—Retention—"Perineal section" nearly six months after the injury—Catheter retained four days—Severe recurring chills—Relapse—Perineal fistula—External perineal urethrotomy with conductor, four months after the first operation—No catheter retained—No chills or urethral fever—Good result.*

For the details of this case see page 131.

CASE XIX.—*Traumatic stricture from a fall astride of a beam—Much straining in micturition—Occasional retention—External perineal urethrotomy with a conductor—No catheter retained—No urethral fever—Good result.*

G. J., 28 years old, a carpenter, of temperate habits, fell astride of a beam whilst at work, on December 15, 1865, from a height of six feet. He experienced considerable pain and was conveyed home. On examination, two hours after, he noticed his scrotum and penis black from

ecchymosis. He passed bloody urine half an hour after the injury, in a small stream and with a great deal of smarting. The constant flow of blood from the urethra did not cease till twelve hours after. In a week's time he went to work, feeling quite well, but in fourteen days from the date of the injury he had a retention, and from that time experienced difficulty and pain in micturition. In January, 1866, he had constant desire to urinate, and strained violently to pass only a few drops of water, with occasional complete retentions. No instrument could be even engaged in a very dense and tight stricture, situated in the vicinity of the triangular ligament.

He had applied to several surgeons who attempted catheterism, but without success. He only obtained relief after the use of hot fomentations and baths.

In view of the great danger of retention and extravasation, I concluded, after consultation with Dr. Van Buren, to perform external perineal urethrotomy. On February 1, 1866, with the kind assistance of Dr. Van Buren, Dr. Cunningham, of Kentucky, and two other medical gentlemen from the South-west, the patient was etherized and placed in the lithotomy position. After the introduction of No. $\frac{1}{4}$ bougie, to serve as a guide, the dense stricture was freely divided from without upon a grooved probe, longitudinally and in the median line, including half an inch of the uncontracted urethra in front and behind. No. 17 steel sound was then introduced into the bladder and withdrawn. The structure of the bulb was very dense and bloodless, and little hæmorrhage followed.

The scrotum was supported by a sling bandage, to guard against infiltration. No catheter was retained. No chill occurred. The pulse at no time exceeded 80 in a minute.

The escape of the urine through the wound and through the urethra in front caused but little smarting. During the first forty-eight hours the urine flowed entirely through the natural passage, and then through the perinæum when the tumefaction of the lips of the wound had ceased. No. 17 was introduced on the fifth day; on its withdrawal about a teaspoonful of blood escaped. Afterwards the sound was passed every third day.

On the twentieth day the wound had so far healed that no urine passed through. No. 17 was then introduced without difficulty. Two weeks subsequent to the above date I found an impediment at the seat of the stricture, and a sound of fair size could not be introduced, though

a proper guide had been passed into the bladder. By the advice of Dr. Van Buren, no instrument was used for one month, and at the expiration of that time the stricture had so far recontracted as hardly to admit No. 10; still he passed a good stream.

I saw the man about eight months after, and he stated that he was still doing well; but he did not return for treatment, as he promised.

I visited him on the 17th of January, 1868, and found him in excellent condition; he had had no trouble in micturition, and was making a good jet of urine, though he had used no instrument since May, 1866.

CASE XX.—*Traumatic stricture from fracture of the pubes—Extravasation—Urinary fistulæ in the thigh and hypogastric region—Cystitis—Constant dribbling—External perineal urethrotomy with a conductor—No catheter retained—Erysipelas on the third day—Secondary abscesses of the thighs—Death on the nineteenth day, from pyæmia—No autopsy.*

James G., æt. 24, of intemperate habits, was admitted to St. Vincent's Hospital on March 7th, 1867, suffering from traumatic stricture of the urethra and urinary fistulæ. He stated that while at work in Pennsylvania, on July 11th, 1866, he fell between two canal-boats which were in motion, and was badly crushed. A few minutes afterwards he passed a considerable quantity of blood *per urethram*, and for the ensuing twelve days bloody urine dribbled from him. A catheter was introduced every second day while he was under treatment in the country, until it was no longer possible to pass the instrument—a period of three months. Two months after the injury an abscess formed in the hypogastric region, to the right of the median line, and a second at, or about, the middle of the right thigh, both of which opened spontaneously, after several weeks of intense suffering, and discharged pus and urine. Soon after, his water ceased entirely to flow by the natural passage.

On admission to hospital the patient presented the aspect of continued intense suffering, with an anxious countenance, flushed cheeks, suffused eyes, hot and dry skin, and frequent pulse; and was, naturally, very nervous and unsteady. A strong urinous odor emanated from him.

On examination there was found a fistulous opening with pouting lips, situated about two inches to the right of the median line, and the

same distance above Poupart's ligament, through which a flexible catheter was passed into the bladder, giving vent to urine loaded with pus. A second opening existed at the apex of Scarpa's triangle, in the right thigh, through which urine was trickling, but the tract was so devious that neither a probe nor a flexible catheter could be made to enter for more than three or four inches. This, the patient said, was the main channel for the escape of his urine; only a little, at times, passing out of the upper fistula.

Exploration with bulbous bougies revealed a firm and resisting obstruction in the vicinity of the triangular ligament, through which nothing but a No. $\frac{1}{4}$ whalebone bougie could be passed into the bladder. In front of this point the canal was normal.

Digital examination *per rectum* showed that the rami of the pubes and ischia were considerably out of place, encroaching very much upon the lower pelvic outlet, evidently the result of a fracture sustained at the time of the injury.

These facts were verified by my colleagues, and it was unanimously agreed that an attempt should be made to re-establish the natural passage for the urine, and so promote the healing of the fistulous tracts. Accordingly, on March 16th, the man was subjected to the operation of external perineal urethrotomy.

The patient being etherized, and placed in the lithotomy position, I proceeded to introduce a capillary whalebone bougie into his bladder, the operation being facilitated by filling the urethra with oil. This accomplished, I passed down to the obstruction by the side of the bougie a grooved steel staff, and opened the urethra in the usual manner upon its point. Next, a small grooved probe was introduced through the stricture by the side of the guide, and the whole constricted portion thoroughly divided, together with a quarter of an inch of urethra behind. The bladder was then emptied with a female catheter passed through the wound, and No. 15 steel sound carried through the whole length of the urethra and immediately withdrawn. The rami of the pubes were so closely approximated that my little finger could not pass between them. No catheter was retained. The patient was carried to bed, and rallied well in a few hours from the anæsthetic.

March 17th.—The patient was seized with vomiting, and could retain no nourishment. He passed urine pretty freely through the perineal wound and the urethra, but none came through the fistulæ.

March 18th.—There was an erysipelatous blush around the upper

fistula, with the usual constitutional disturbance; other patients in the ward also suffering with erysipelas. Half of the urine then passed out of the upper fistula, and the rest escaped through the urethra in a good stream.

March 23d.—The patient had a pulse of one hundred and twenty, but it had not been lower since the operation. Dark-colored tenacious pus issued from the upper fistula. The erysipelas had extended over nearly the whole abdomen and down both thighs as far as the knees, but the genitals had escaped. The perineal wound was in a good condition. No. 12 sound introduced.

March 25th.—Pulse one hundred and twenty-eight. The patient continued to vomit after taking food or stimulus even in the smallest quantities. A large abscess, which had formed in the inner side of the right thigh, was opened in the morning, and a quantity of most fetid pus evacuated.

March 26th.—Vomiting at last arrested by oxalate of cerium. Pulse one hundred and ten. Tongue dry and red. The urine flowed through all the openings as well as through the urethra. Another large abscess was opened in the upper part of the left thigh.

March 27th.—The patient had passed but little urine. The two abscesses were discharging profusely.

March 29th.—Vomiting had recurred, and resisted obstinately all efforts to check it. The tongue was dry and dark, and the pulse still one hundred and ten.

March 31st.—The patient vomited less, but had a pulse of one hundred and twenty, and cold sweats, and had passed but ten ounces of urine in the twenty-four hours.

April 2d.—The discharge from the abscesses was still profuse and exhausting. There was no change in the patient's condition, save the supervention of delirium.

April 4th.—Death occurred, and the friends prevented an autopsy.

REMARKS.—Judging from the account given by the patient, it would seem as if the crushing force had acted upon his pelvis in a lateral direction; this explains the laceration of the urethra. Whether the bladder was ruptured at the time of the accident is not certain; however, it is highly probable that a fragment of bone had so impinged upon its anterior surface as to have led to

sloughing of its walls, and to the abscess and fistula in the hypogastric region. That the pubis of the right side was the more badly crushed was evident from the unusual course the urine had taken.

His chances of recovery would doubtless have been greatly increased had he been subjected to the operation a few days after the occurrence of the injury. The extravasation would in all probability have been warded off by free division of the urethra. And afterwards, by the occasional introduction of a large sound, he would have been spared the suffering which followed the formation of his obstinate stricture.

Notwithstanding the lateness of the surgical interference, I thought that his condition was by no means hopeless, until he was attacked with erysipelas, which was prevailing in the hospital.

CASE XXI.—*Traumatic stricture from severe contusion of the perinæum—Retention on the eighteenth day—Urethra very sensitive—Dribbling—Threatened retention—External perineal urethrotomy with a conductor—No catheter retained—No urethral fever—Good result.*

J. O'C., æt. 37, a laborer on the Erie Railroad, was admitted to St. Vincent's Hospital on the 5th of August, 1867, at 4 o'clock P.M. While standing upon the step of a car, at 10 o'clock in the morning, he was severely jammed between the car and an embankment, close to which the train was moving. He says that he was carried along, describing a rotary movement in the upright position, until the car had passed the embankment, when he fell upon the track. At that time he felt something escaping from his urethra, but did not know whether it was urine or blood. When admitted to the hospital he could pass no water, and the house surgeon succeeded in introducing a No. 7 catheter, and in drawing over a pint of bloody urine. At the time of admission there were evidences of severe contusion about the genitals. There was a great deal of ecchymosis in the perinæum, scrotum and hypogastrium, also in the upper part of the thighs. For two weeks after the injury he could not pass water without the aid of the catheter. The urine drawn was bloody for the first four days. Fifteen days after the injury he com-

plained that he could not eject his stream of urine with so much force as before. On August 23d, the eighteenth day, he had a retention which was relieved by a warm hip-bath and a dose of opium. On the following day, the house surgeon attempted to introduce a No. 7 catheter, but found an impediment six and a half inches from the external orifice, which he could not overcome. A hot fomentation was applied to the hypogastrium, and a dose of opium given; relief followed this.

Since the last retention he was greatly troubled with dysury, and after violent and very painful straining the urine came only by drops.

I first saw him on the 2d of September. No. 7 sound was then arrested six and a half inches from the external orifice. No. 1 flexible was with difficulty passed beyond the point of contraction; after this, dilatation was gradually carried up to No. 5, but nothing larger could be introduced. The urethra was extremely sensitive in the vicinity of the obstruction, and bled after the most gentle use of instruments. For several days subsequent to the partial dilatation he made water better, and in a continuous stream. At the expiration of five days his stream began to decrease, his urine became purulent and alkaline, and No. 4 only could be passed.

Several medical gentlemen saw the case with me, and were disposed to advise the continuance of gradual dilatation, with the understanding, however, that external perineal urethrotomy should without delay be resorted to in case of failure or the supervention of retention.

During the consultation the man eloped; but finding himself getting rapidly worse, he returned on September 12th. He was re-admitted on condition that he was to submit to an operation. After two more fruitless sittings, I concluded that further attempts at dilatation would only be loss of time, and that longer delay would in all probability prove harmful.

On September 17th the patient was etherized and placed in the lithotomy position. With the kind assistance of Professor Cabell, of the University of Virginia, Drs. Clymer and Creamer, I proceeded to perform the operation. An ounce of warm oil was injected into the urethra, and a filiform whalebone bougie introduced to serve as guide for a grooved and tunnelled steel staff. The usual perineal incision was made and the urethra opened longitudinally upon the point of the staff, then a small grooved probe was carried into the bladder alongside of the whalebone guide, and the stricture and urethra behind freely and thoroughly divided. The meatus, which was too narrow to admit a

full-sized instrument, was deeply incised with Civiale's "bistouri caché," and No. 18 conical steel sound introduced into the bladder. The hæmorrhage was trifling. The urine issued from the perineal wound for the first day, but afterward none escaped therefrom until September 23d, when he made a large stream out of the natural passage.

On September 30th he was walking about, the urine had ceased to flow from the perineal wound, which was almost healed to the surface. No catheter had been retained, no urethral fever had occurred, and he progressed without any unfavorable symptoms. No. 17 conical steel sound had been introduced every second day. He was soon taught to use an instrument (No. 15) for himself. I did not give him a larger instrument, as I felt confident that he would omit its use from dread of pain.

He introduced his instrument three times a week until November 14th, but then complained of occasional pains in the testicles, and once one of them was swollen and inflamed; rest and a warm fomentation relieved him. I advised him to use the instrument but once a week, with greater care and gentleness.

On December 12th he called to report himself and passed No. 15. I then introduced with ease No. 16.

On January 22, 1868, I passed Nos. 15 and 16. His stream of urine was normal and his condition excellent.

On August 3, 1868, he came to introduce his instrument before me, and to say that, having again fallen into a careless and rough way of using his instrument, he had had two attacks of orchitis, but he was then in good health.

CASE XXII.—*Traumatic stricture (impassable) from fracture of the pubes—Dysury in four weeks and retention in ten weeks after the injury—Treatment by dilatation unsuccessful—False passage—Enlarged prostate—External perineal urethrotomy without conductor—Relapse—A second operation after five and a half months—No urethral fever—No bad symptoms—Good result.*

F. McG., 46 years of age, was admitted to Bellevue Hospital, May 20, 1868.

On February 28, 1868, whilst at work, he was crushed between two heavy stones, the violence acting sidewise in the region of his pelvis, and fracturing his pubes. Eight hours afterwards he passed some bloody urine, and so continued for two weeks. Dysury began four

weeks after the injury. His stream was noticeably smaller than usual, and further decreased in size until retention took place, and he sought relief at the hospital on May 20th. His stricture was gradually dilated until June, when he could pass a tolerably good stream, but dilatation was not carried beyond this point.

During the summer he was attacked with diarrhœa, and was sent to one of the medical wards, where he remained until cured of his diarrhœa, but received no treatment for the stricture, which rapidly retracted.

From the medical division he was sent to one of my wards, where, on the 2d of October, I first saw him. He was then suffering intensely from dysury and sometimes from enuresis.

After his admission to the surgical side it was impossible to pass even the smallest flexible instruments. Prior to October 2d every attempt at catheterism was followed by rigors and suppression of urine, which often necessitated dry-cupping in the region of the kidneys, and other and more active treatment.

At first I ordered rest in the horizontal position, hip-baths, diluents, and tincture of chloride of iron; and on the 7th of October I made the first exploration. Bulbous bougie No. 13 passed without impediment to six inches and six-eighths from the external orifice and was there arrested; the smallest whalebone bougies could not pass beyond this point, the urethra having been filled with oil to facilitate exploration with the small instruments.

A false passage, extending from the obstruction to the under-surface of the prostate, was detected with a No. 7 instrument. This false route had probably been made several months before, when, I understand, forced catheterism was attempted.

The prostate was found, on examination per rectum, to be about twice as large as normal.

All available means had been perseveringly tried to reach his bladder by the natural route, for a month, but no success was attained. He passed his urine partly in drops, partly in a small stream, and could never completely empty his bladder, so that the desire to urinate was constantly recurring. His general health remained good, though his symptoms were rapidly increasing in severity.

He was extremely anxious for an operation, in order that he might resume his occupation. In view of the danger of another retention, and of the probability of having to perform the operation under the

most unfavorable circumstances, I determined to try tapping his urethra behind the stricture, after the method of Mr. Edw. Cock, of London, and then to introduce a grooved probe through the contracted urethra from behind, and to divide it freely. Accordingly on November 4, 1868, the patient was etherized and placed in the lithotomy position, the index finger of the left hand introduced into the rectum, and the knife plunged carefully into the median line of the perinæum three-quarters of an inch in front of the anus, until its point reached the apex of the prostate; but no urine flowed, nor could the canula be introduced into the bladder, as the false passage only had been incised. This failing, and much hæmorrhage following, I passed a grooved staff through the urethra in the usual way, down to the obstruction, and incised the latter upon its point. After considerable delay I succeeded, not without great difficulty, in passing a small grooved probe through—as I thought at the time—the stricture and in dividing it. After this the staff was passed into the bladder, and then, by the perineal wound, a female catheter, through which some urine flowed; the catheter was tied in position for twenty-four hours.

As a result of the original injury, the pubic rami were found so closely approximated that the index finger, introduced through the wound, came in contact with either bone. A pint and a half of blood was lost during the operation, and stimulants had to be administered to the patient to support his strength. The hæmorrhage ceased spontaneously, but as a precaution against further flow a pledget of lint was introduced into the wound.

The patient had no untoward symptom, and was up and about the ward on November 16th, the twelfth day. Urine had ceased to pass through the perineal wound on the ninth day. It was impossible to pass any instrument into his bladder after a few days. A No. 12 flexible olive-pointed catheter was introduced as far as the prostatic sinus, and a few drops of urine flowed, but it could not be made to enter the bladder. A No. 14 steel sound was passed in seven inches, every second day.

On November 21st, I found the perineal wound nearly healed externally, not a drop of urine issuing. He made five ounces of urine before me without straining. Before the operation he suffered from hæmorrhoids, and had a fissure of the anus from constant straining, both of which have since disappeared.

He urinated every three hours through the day, but was still disturbed

at night. On November 24th, I passed No. 17 seven inches back. As it was impossible to introduce instruments beyond the stricture and fairly into the bladder, recontraction soon occurred, and finally, April 18, 1870, retention of urine, which was relieved by hot fomentations, a hip-bath, and a dose of morphia.

Second Operation.—Fearing another retention, I determined to perform a second operation, which was done April 21, 1870. I again failed to pass a conducting bougie, and was obliged to cut upon the point of the grooved and tunnelled catheter-staff. The interior of the urethra was brought to view with the aid of the loops of silk, but after the most prolonged and diligent search, I could not find the mouth of the stricture, so I passed a double-edged scalpel in the median line nearly to the neck of the bladder, and in withdrawing it cut along the upper wall of the urethra as far forward as the beginning of the incision made upon the point of the staff. In this last attempt I think the whole stricture, which was probably eccentric, was divided, and the instrument went in; some urine was drawn off, and a flexible catheter retained thirty-six hours. Hæmorrhage ten ounces. Chill in the evening. On May 8th the wound had completely healed. Instruments were passed every second day to No. 15, and he was discharged, passing a full stream, June 15, 1870, after having been taught to introduce an instrument (No. 15) for himself.

REMARKS.—It seems probable that in the first operation the stricture had escaped complete division, and this accounts for the failure of catheterism and the relapse. It is also clear that external division should have been performed when he first entered the hospital in May, 1868.

CASE XXIII.—*Traumatic stricture from severe contusion of the perinaeum—Dilatation to No. 18—Relapse—Perineal abscess—External perineal urethrotomy (Syme's)—No catheter retained—No urethral fever—Good result.*

Thomas S., aged 36, admitted to Bellevue Hospital, November 23, 1868. Six weeks before, while walking across a railroad bridge, he fell astride of one of the sleepers and severely contused his perinaeum. Much scalding, together with a considerable amount of hæmorrhage, accompanied the first two acts of micturition. Immediately after the

injury a swelling appeared in the perinæum, which increased to the "size of a man's fist" within twenty-four hours, and interfered much with urination, and the stream in a few days was very diminutive. At that time catheterism was unsuccessful. When admitted to the hospital he was suffering from retention of twenty-four hours' standing. Another attempt to relieve him had been made, outside, on the night before, but failed. The house surgeon succeeded in drawing off the urine with a No. 3 gum-catheter on the morning of his entry into Bellevue, and discovered the tumefaction of the perinæum. It was hard and resisting, and evidently an abscess in process of formation. I saw the man on the same day, and ordered the retention of a No. 3 elastic catheter for twenty-four hours, to guard against further over-distension of the bladder.

On November 24th I slit the meatus, which was abnormally narrow, and proceeded to exploration and dilatation, which in a few days was carried to No. 18. He left the hospital, but returned on December 12th with retention of urine, and the abscess softened. A bulbous bougie found an obstruction six inches back. He was immediately etherized, and an attempt made to pass Syme's staff; failing, I tried slender spiral whalebone bougies, and one of them entered the bladder, and served as a guide for Syme's staff, the shoulder of which rested against the obstruction. A free incision was made in the median line, the abscess laid open, the sloughs removed, and the urethra, at the seat of injury, incised for one inch, upon the groove of the staff. Hæmorrhage very slight. No catheter retained. Chill a few hours after the operation, and another on the day following: but neither was followed by fever. Warm bath. Quinine.

December 18th.—Nos. 14, 16, and 17 steel sounds were introduced.

December 19th.—Chill in the morning. Quinine and iron.

December 23d.—Two unsuccessful attempts having been made to introduce sounds, I passed, through the perineal wound, a grooved director into the bladder, and with a beaked bistoury enlarged the urethral cut posteriorly. After this I was able to introduce with more facility sounds to No. 18, which were continued every third day until February 22, 1869, when he was discharged, the perineal wound having completely healed—six weeks after the operation. The patient had been taught to pass his own instrument, and advised to continue its use once a week for an indefinite time.

CASE XXIV.—*Traumatic stricture from contusion of the perinæum—Frequent retentions in the space of ten years—Constant dribbling from overflow—Cystitis and pyelitis—External perineal urethrotomy with conductor—No catheter retained—Chill on the fifth day—Irrregular slight rigors every day—Death on the seventeenth day, from advanced disease of the bladder and kidneys.*

L. C. F., aged 27, intemperate, admitted to Bellevue Hospital, January 16, 1869. When a child, this patient fell through a hole in the ice, bruising his perinæum. Ever since this accident he has had more or less trouble in micturition, often suffering from enuresis, sometimes from complete retention. Ten years ago, while constantly subjected to exposure, as a hack-driver, his symptoms were much aggravated, but were afterward relieved, until 1862, when he again began to suffer from dysury, which was soon followed by dribbling of urine from over-distension of the bladder. He continued twelve months in this state without obtaining any relief. At about that time an abscess formed in the perineal region, opened spontaneously in the urethra, while he was straining at stool, and about two ounces of pus escaped, after which the urine came in full stream. For two years after this occurrence he felt better, but had a persistent gleet. During these two years he had no enuresis, although he had several attacks of retention of twenty-four hours' duration. He has since had very frequent partial and complete retentions, and is in consequence in a very feeble state of health; is very pallid, and has the facies of renal disease; suffers from headache, dizziness, *muscæ volitantes*, nausea and loss of appetite; withal he is not much emaciated. His urine dribbles away constantly, and he has long been obliged to wear a rubber urinal on that account.

January 26th.—He has been under iron and quinine and extra diet, and efforts have been made to dilate the stricture, but without success. The stricture is four and a half inches from the external orifice and will only admit a filiform bougie.

I took charge of him on January 26th, and some of my colleagues who saw him with me were of opinion that though the case was unpromising, there was nothing left for him but free external division of the stricture, as he must soon die if unrelieved. I took the same view of the case, and on the 27th performed external perineal urethrotomy, with a capillary whalebone bougie as conductor for my tunnelled and grooved catheter-staff. After opening the urethra and holding the edges of the wound apart by means of the loops of silk, the black guide

was distinctly seen by my assistants and others who were near. The urethral incision was extended back as far as the triangular ligament, the staff slid into the bladder, and some purulent urine drawn. No. 12 sound; hæmorrhage inconsiderable; no catheter retained; quinine, ten grains.

February 1st.—Chill; febrile reaction; vomiting; pain in the region of the bladder and kidneys; urine bloody.

These symptoms increased in severity until February 8th, when he became delirious, and on February 13th he died.

AUTOPSY.—Abscesses in corpora cavernosa and in corpus spongiosum. Concentric hypertrophy of the bladder with chronic inflammation of the mucous membrane.

Ureters and pelvis of the kidneys greatly dilated; kidneys enlarged and containing many small abscesses; numerous abscesses in both lungs; large cavity in lower lobe of left lung.

CASE XXV.—Occlusion of the urethra with urinary fistulæ, from a fall astride of a fence—Cystitis—Dribbling—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Rapid subsidence of the cystitis—Relieved.

George G., æt. 12, was admitted to the Nursery Hospital, Randall's Island, under Dr. Henry N. Whittlesey, July 14, 1866, suffering from perineal fistulæ. His history was as follows: In the latter part of July, 1864, he missed his footing while walking upon the top of a fence, fell astride thereof and received the full force of the fall upon his perinæum. An abscess soon formed at the seat of injury, and opened spontaneously; and through the openings thus formed, which had ever since remained pervious, he had passed all of his urine; almost immediately after the opening of the abscess he ceased entirely to make water through his urethra, and, as the urine only escaped through the perineal orifices by drops, he suffered a great deal from over-distension of the bladder and from cystitis.

I saw this patient with Dr. Whittlesey, October 13, 1866. The boy's countenance was indicative of constant suffering, but he seemed entirely free from constitutional taint. His perinæum was much indurated, and red and inflamed from the constant flow of urine, which percolated through numerous minute orifices, like those in the spout of a watering-pot, and through a small opening in the right side of the scrotum posteriorly. The scrotum itself was diminished in size, apparently by

sloughing, and the testicles were firmly retracted against the external abdominal rings.

On making an examination with a small bulbous bougie an obstacle was encountered, four and a half inches from the meatus, which was impassable to even a No. $\frac{1}{4}$ whalebone bougie, and which the history of the case, enforced by the examination, clearly evidenced to be a complete occlusion of the urethra.

I advised external perineal urethrotomy as a means of establishing a large permanent perineal fistula rather than an attempt to reform the urethra, since in my judgment the case offered very little probability of the accomplishment of the latter indication; yet there could be no objection to making a division of the whole cicatricial mass at the same time.

At the request of Dr. Whittlesey, I proceeded to perform the operation. The patient, having been etherized, was placed in the lithotomy position, and a small-grooved staff passed into the urethra as far as the obstruction. The canal was then opened upon the end of the staff, and a careful attempt made to find a channel through the stricture, but not even by the smallest probe could any orifice be detected. A very delicate probe was therefore introduced into one of the perineal fistulae, and carefully pushed along till it entered the bladder; the mouth of the fistula was enlarged with a narrow bistoury, and a small-grooved probe passed in beside its fellow; finally the urethra was freely incised upon the groove, and the incision carried forward through the inodular tissue of the stricture. A No. 7 steel sound was then passed into the bladder. No catheter was retained.

The patient had no urethral fever, and in fact not a single bad symptom. The urine was passed voluntarily through the wound, after the operation, and his cystitis rapidly subsided. Occasionally some of the urine escaped through the whole length of the urethra. A No. 7 flexible catheter was passed into the bladder through the perineal wound every second day, and another instrument was made to appear at the wound when introduced through the meatus.

January 25, 1867.—The boy is now about the ward, and micturates voluntarily in a good stream through the perineal wound, which has now contracted so much that it will only admit a No. 7 flexible catheter. A smaller metallic instrument passes with some difficulty and pain into the bladder through the whole length of the urethra.

January 5, 1868.—On inquiry at Randall's Island I learned that the patient was removed by his father only a few days before; that he was

in excellent general health; and that he still urinated at will in a good stream through the perineal opening, some of the water escaping at each act through the whole urethra. The fistula was kept open for nearly two years, by the occasional introduction of a No. 8 catheter; but after he ceased the use of the instrument the fistula soon contracted and almost entirely closed. The patient was then subjected to a second operation by Dr. Stephen Rogers, who informed me that the wound had entirely healed, and that the boy was doing well when last heard from.

CASE XXVI.—*Occlusion of the urethra with urinary fistula from a fall astride of a manger—Dribbling of urine through the fistula—Great straining in micturition for two years—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Relieved.*

R. T., 35 years of age, a wagoner, of intemperate habits, was admitted to Bellevue Hospital on the 10th of October, 1867.

Two years previously this man, while climbing into a hay-loft, fell astride of a manger, to which was attached a chain halter; the cross-piece at the end of the chain inflicting a deep wound in the perinæum, and lacerating the urethra in the region of the bulb. A considerable hæmorrhage occurred at the time of the injury, and he was conveyed to the hospital on the following morning. Within a few days he suffered from retention, followed by extravasation of urine, and his scrotum became greatly distended; to relieve this a free incision was made into the perinæum. In the course of four and a half months the greater part of the wound had cicatrized, but there remained a fistulous opening, through which all of his urine was voided. At that time a full-sized sound was passed to, but not through, a stricture which had already formed at the seat of injury. He was then discharged from the hospital.

He stated that, ever since the accident, his urine had continued to dribble through the perineal wound, which had been gradually contracting, and that none whatever had passed through the anterior part of the urethra. He became completely impotent from the injury.

I first saw the patient on October 10, 1867, the day of his readmission, when I proceeded to the examination of his case.

No. 10 bulbous bougie was arrested five inches from the external orifice, and a smaller sized instrument at five and a half inches. The

smallest sized filiform bougie could not be carried beyond the last-named point. I expressed the opinion that the urethra was probably occluded at the seat of injury. This opinion was based upon the above fact and also upon what was elicited from the patient, viz.: that he had not, since the injury, passed a single drop of urine through the natural route. A fine probe, inserted into the fistulous track, was arrested at a short distance in its way toward the bladder.

With a great deal of straining and agony for fifteen minutes, this man passed drop by drop before me, through the fistula, about three drachms of acid urine, which on microscopic examination was found to contain a considerable amount of pus and some blood. He had been for several months tortured by constant desire to urinate, his calls were as frequent as every half-hour during the day, and at night the urine dribbled involuntarily from the fistula. With each effort at micturition his rectum prolapsed. Life was becoming unendurable to him, and he begged for relief by any operative procedure "the surgeons might see fit" to adopt.

By palpation in the hypogastric region and by rectal exploration with the finger, it was ascertained that the bladder had undergone concentric hypertrophy. He complained of no tenderness in the course of the ureters, but had pain in the region of the kidneys.

I thought it therefore highly probable that neither of these organs had escaped the damaging action of the dammed-up urine.

My colleagues were of opinion that he should have the chance of external perineal urethrotomy, even if it should only serve to enlarge the existing fistulous opening, but that it was justifiable to make a free incision through the obstacle at the same time.

On October 12, 1867, the patient having been etherized and placed in position, I proceeded to operate as follows:—

After another careful exploration, I passed a grooved staff down to the obstruction and made an incision upon its point, laying freely open the urethral canal. I then passed a loop of silk through each lip of the incised urethra to keep it open, and thus to enable me, with a fine probe, to find the orifice of the stricture, if one should still exist; but after a careful and prolonged search, I concluded that my suspicion of complete occlusion was well founded.

After this a small-grooved probe was introduced through the fistulous track into the urethra behind the obstruction, and with a narrow sharp-pointed knife, passed along the groove of the instrument, the parts were

freely divided. A deep longitudinal incision was then made through the inodular mass which had given rise to the occlusion, and the urethra was thus converted into a continuous canal. After free division of the meatus, a broad-grooved director was introduced through the perineal wound into the bladder, to serve as a guide for the passage of sounds up to No. 16. The operation occupied nearly one hour and was the most prolonged and the most difficult I had ever undertaken. No catheter was retained.

On October 15th, a No. 15 steel sound was with difficulty passed into the bladder, and the patient suffered great pain in consequence. With the exception of a cough which gave him some trouble, his general condition was good. On the 22d of October, I attempted to pass a No. 10 sound into his bladder, but the instrument was arrested at the point of old occlusion. He complained so much of pain that no attempt was made to carry the instrument farther. The urine came in a large stream through the perineal wound, which was all healed but a small opening. No urethral fever or other unpleasant symptoms had occurred.

On October 23d, No. 12 sound was introduced into the bladder, but with excessive pain. Up to November 4th, No. 12 had been passed every other day. The patient had continued to void his urine by the urethra and by the perineal opening, which had materially diminished in size. He was taking quinine and iron on account of occasional slight chills.

On November 5th, Nos. 10 and 11 were passed into the bladder, and gave considerable pain. He stated that he passed a good-sized stream through the urethra, but that some urine still escaped from the fistulous opening.

On November 11th, No. 10 could be introduced only as far as the stricture, which seemed to be recontracting; however, he made his water almost entirely through the urethra.

Up to December 23d, No. 11 conical sound had been inserted every alternate day, as far as the obstruction would allow, but without entering the bladder. His jet of urine had then greatly increased in size. During the night the urine dribbled through the wound and also through the urethra. He passed in all about three pints of urine during the twenty-four hours.

A consultation was held on the 14th of January, 1868, to consider the propriety of again performing external perineal urethrotomy, as the fistula was rapidly contracting, likewise the stricture, which would not

then admit No. 9 conical sound. I proposed division of the stricture and the introduction of a gum catheter to be retained in position, and replaced by a new instrument every twenty-four hours to prevent incrustation; this to be continued for one week, then to introduce daily a full-sized sound for the succeeding two months, and afterwards less frequently. Before this plan could be carried out the patient left the hospital. I have seen him three or four times since, and passed No. 8 through the contracted urethra, but not into the bladder. When last seen (in June, 1868), the urine was still dribbling from the fistula after micturition, but his general health was much better than when he was an inmate of the hospital.

CASE XXVII.—*Resilient stricture of fifteen years' standing, with urinary fistula; due partly to gonorrhœa and partly to a contusion of the perinæum (mixed)—External perineal urethrotomy, according to Mr. Syme's method—Catheter retained in position for forty-eight hours—Urethral fever—Good result.*

A., æt. 45, a sailor, of intemperate habits, was admitted to Bellevue Hospital about the 1st of November, 1859, with stricture of the urethra and several perineal fistulæ, besides one fistula over the pubes. He stated that he had contracted gonorrhœa several times, and for fifteen years he had symptoms of stricture. About six years before his admission to hospital he had fallen astride of a rope while at sea, and bruised his perinæum, but suffered very little from the accident. He came under my care on April 2, 1860, with a stricture that would only admit a No. 6 steel sound, and would rapidly recontract if the use of the instrument was discontinued, and with unhealed fistulæ; although dilatation had been faithfully and persistently tried for the preceding five months.

In view of the resiliency of the stricture, and of the failure after such prolonged efforts to dilate it sufficiently to allow the closure of the fistulæ, it was determined upon consultation to perform external perineal urethrotomy. Accordingly, in May following, with the assistance of one of my colleagues, I performed the operation after the method described by Mr. Syme, using his grooved staff. The perineal fistulæ were freely laid open, and left to heal by granulation. A No. 12 silver catheter was then introduced into the bladder, secured in position, and retained forty-eight hours.

The patient subsequently passed his urine voluntarily, partly through the urethra and partly through the perineal wound. Urethral fever set

in upon the third day, and ran its usual course. A No. 12 steel sound was introduced every second day for a while, and afterwards Nos. 13 and 14; the patient was allowed to get up in three weeks, and in six weeks the wounds had entirely healed, as had also the supra-pubic fistula. He was discharged from the hospital three months after the operation, having been previously instructed in the art of introducing his own instrument.

This man subsequently enlisted in the army, and did good service. I saw him two years afterwards, acting as a hospital attendant, and found that he persevered in the use of his No. 12 steel sound every third day.

CASE XXVIII.—*Old impassable stricture, partly due to gonorrhœa, partly to a bruise of the perinæum upon the pommel of a saddle (mixed)—Retention—Catheterism unsuccessful—External perineal urethrotomy without conductor—Catheter tied in position, but removed within two hours by the patient—Instrument not reintroduced—No urethral fever—Good result.*

McW., 35 years of age, a teamster, of intemperate habits, applied for relief early in June, 1861.

He was at that time suffering very great pain from retention of urine, consequent upon stricture of the urethra due to numerous gonorrhœas, and more recently to an injury of the perinæum, by being thrown violently forward upon the pommel of his saddle.

His bladder was distended to the level of the umbilicus. Various means had been tried for his relief, but in vain. He was then placed in a hot hip-bath and catheterism tried, first with a large instrument, then with filiform elastic bougies, but all failed.

In order to ward off extravasation and its consequences, it was deemed best to perform external perineal urethrotomy with as little delay as possible.

The obstruction having been previously ascertained to be in the posterior portion of the bulb, the patient was etherized and placed in the lithotomy position. A full-sized sound was passed down to the stricture, and the urethra incised longitudinally upon its extremity; a very fine-grooved probe was then introduced through the contraction, which was freely divided upon its groove, the incision being carried back a quarter of an inch through the uncontracted urethra.

The whole length of the urethral incision, including the strictured part, was about one inch and a quarter.

Two quarts of urine were drawn, by means of a female catheter inserted through the perineal wound.

A No. 12 silver catheter was introduced into his bladder and tied in position; but two hours afterwards I was called to see the patient, and found that while recovering from the effects of the anæsthetic he had pulled it out. I tried to reintroduce the instrument, but he became so unruly that I abandoned the idea, and left him to pass his urine through the wound.

No urethral fever; not a bad symptom followed, and he made an excellent recovery. In four weeks no urine escaped any longer through the perineal wound, which had very nearly healed.

No. 12 steel sound had been introduced every second day, and he was advised to continue its use.

I saw him again four months after the operation, when he stated that he had no trouble in micturition and that he felt as well as ever, though he had not since introduced any instrument.

One of the gentlemen who assisted me at the operation saw the patient on the 23d of November, 1861, over five months after the operation, and passed into the bladder with ease No. 8 steel sound, which was the largest instrument he had in his possession.

CASE XXIX.—Impassable strictures, due partly to gonorrhœa, partly to laceration of the urethra from torsion of the penis (mixed)—Retention—Extravasation—Incisions made into the scrotum to give issue to extravasated urine—Urinary fistulæ—External perineal urethrotomy without conductor—No catheter retained—No urethral fever—Good result.

Patrick L., aged 32, of intemperate habits, admitted to Bellevue Hospital, November 2, 1866, suffering from urinary fistulæ. He had had gonorrhœa twice, the first attack about twelve years ago; the discharge continuing for about two months. There was no diminution in the size of his stream of urine after this attack. His second "clap" was contracted three and a half years ago, and lasted about five weeks. This was followed by a gleet of a year's duration, after which he noticed that his stream of water was smaller than usual and was at times forked and at other times spiral. He also had too frequent desire to urinate, but no retention until September 13, 1866. Fifteen months prior to admission a large abscess appeared in the perinæum, which subsequently opened spontaneously, discharged pus and urine and continued

patulous, in the shape of two fistulous orifices on either side of the median line, until the date of his admission.

On September 13, 1866, having indulged too freely in spirituous liquors, he attempted to perform the marital act, but failed: his wife, also maddened with liquor, seized the penis and bent it upon itself, then pulled and twisted it violently. Immediately afterwards, a considerable quantity of blood escaped from the meatus. There followed, also, very great extravasation of blood in the connective tissue of the penis and scrotum, both of which became much distended. The extravasation extended upwards in the hypogastric region nearly to the umbilicus. At the time of the injury his bladder was full. For the following thirty-six hours he was not able to pass a drop of urine. Dr. Lyster was called in and afterwards Dr. Wood, who made a number of incisions in the penis and scrotum, and withdrew three pints of bloody urine. Since then the urine passed chiefly through the perineal fistulæ. Some escaped through the scrotal incisions, all of which had healed but one. The patient said that sometimes a small stream passed through the urethra. The penis was diminished in size and inclined abruptly to the left at the point of "fracture." The cicatrices of the incisions made a few weeks previously were seen upon the penis and scrotum; the latter displayed quite an extensive granulating surface, in the middle of which a urinary fistula was found. This was situated on the right of the median line. A little farther back and on each side of the median line were the old perineal fistulæ.

From the character of the injury, and the appearance of the parts, it was evident that the corpus spongiosum had been lacerated in front of the old stricture. The corpora cavernosa were also involved in the injury, since he had not been able to have an erection from the date of the injury. No. 10 sound was arrested one inch from the external orifice, No. 8 two inches, and No. 5 bulbous bougie at four inches and three quarters. A filiform bougie, when introduced, escaped through the scrotal fistula. Dr. Lyster stated that on several occasions he had introduced a catheter through one of the perineal fistulæ and drawn off several ounces of urine without passing the instrument into the bladder. This man was already somewhat emaciated, and showed other signs of impairment of his general health. The two perineal fistulæ, the orifices of which were capable of receiving but a small probe, and were liable at any moment to be obstructed by the impaction of calculous matter or of concrete pus, were the main channels for the escape of the urine. The

stricture in front, resulting from such an injury, was one which would resist all efforts at dilatation, and probably end in occlusion of that part of the urethra. The above facts left no doubt in my mind as to the propriety of operative interference, with a view to the relief of the strictures and the cure of the fistulæ, and thus save him the annoyance of constant dribbling of acrid urine between his thighs, and the dangers of frequent retentions, which must end in disease of the bladder, ureters and kidneys.

The surgeons present took the same view of the case, and it was decided to attempt external perineal urethrotomy on the following day, November 4th. The patient was accordingly etherized and placed in the lithotomy position. I made an attempt to pass a filiform whale-bone bougie, but did not succeed. I was then compelled to undertake the difficult task of doing the operation without a guide. A grooved staff was introduced down to the obstruction, and held firmly in position by one of my colleagues. An incision was made in the median line of the perinæum, and the urethra was divided upon the point of the staff. After patient and careful manipulations I succeeded in introducing through the strictures a very fine-grooved silver probe, and in incising them freely enough to enable me to pass a larger sized grooved director into the bladder; this was followed by the escape of some urine. I tried to introduce a No. 10 steel sound, but it slipped out of the groove of the director and did not enter the bladder. I then enlarged the urethral incision sufficiently to admit my index finger into the bladder, and introduced successively Nos. 10, 11 and 12 steel sounds. The hæmorrhage was trifling. No catheter was retained.

On November 6th I passed No. 9 sound down to a point near the triangular ligament, but it did not enter the bladder.

On November 7th and 8th the pulse was 90 and 84. No. 9 steel sound was introduced into the bladder without difficulty. The perineal wound was granulating; no urethral fever.

November 23d.—No. 12. Most of the urine escaped by the meatus, a small quantity only was voided through the scrotal fistula, none by the perineal wound, which was nearly healed.

On April 1, 1867, he had learned to introduce his own instrument, and continued to do so once a week. The penis had never become erect since his entry into the hospital.

On April 16th he was discharged.

In July, 1867, this man called to report that he had been using, once

a week, a highly-polished conical steel sound, No. 12. He had regained his usual strength and health, was making a natural stream, and all the fistulæ had healed, but his penis was in the same state as last noted.

CASE XXX.—*Old idiopathic stricture aggravated by an injury—Retention and extravasation of urine—Fistulæ—External perineal urethrotomy with conductor—No catheter retained—No urethral fever—Good result.*

R. S. P., aged 40, was brought to me by Dr. W. F. Thurston, of the Royal Mail service at Panama, March 1, 1869. Mr. P. had had five attacks of gonorrhœa, the first, twenty-four, the last, eighteen years before I saw him. Three years after the last attack he had marked symptoms of stricture, which went on increasing in severity until he was only able to pass a very narrow and forked stream of urine. While in that critical condition—that is, ten years before the date of our first interview—he met with an accident which greatly aggravated his existing trouble. This occurred in the country while he was riding “bare-back.” His horse stumbling, he was thrown forward, striking his perinæum violently against the withers of the animal, and fell off senseless. On recovering himself he discovered that he had bled freely from the urethra, and for several days after his urine contained blood; then retention supervened, and his servant endeavored to introduce a rush which he had prepared for the purpose, but failed. Fortunately, however, relief came spontaneously. As soon as he could reach a medical man, he had proper instruments used, but they were continued only at very irregular intervals, thorough dilatation never having been made. He thus kept nursing the stricture until some one used undue force and made a false passage. Five weeks before I saw him he had a complete retention, followed by rupture of the urethra and extravasation of urine, when Dr. Thurston made a free perineal incision which gave issue to pus and urine. The wound had not entirely healed when he presented himself to me, and there was, besides, a fistula at the base of the scrotum, anterior to the wound. His general health was tolerably good, though he had suffered from malarial fever contracted at Panama. He passed his urine both by the fistula and by the natural outlet.

Exploration.—Meatus abnormally small, admitting only No. 6 bulbous bougie. No. 4 arrested two and a half inches back, but on moderate pressure was carried to four and three-quarter inches, where it met with the last impediment. The penis was undersized.

Having here to deal with an old idiopathic stricture much aggravated by a more recent injury, and there being much obstruction to micturition, and the stay of the patient in this country being limited to a few weeks, I decided, after due consideration, that free external division would be the most certain way of giving him speedy relief and of insuring the cure of the fistulæ.

He was accordingly kept in the recumbent posture and under the usual preparatory treatment for a few days, and on March 6, 1869, after the administration of ether, he was operated upon as follows:—

The meatus was freely divided, the stricture two and a half inches back divulsed, a spiral capillary whalebone bougie introduced into the bladder, and the tunnelled catheter-staff passed over the guide down to the face of the obstacle and held in position; then an incision was made through the indurated perinæum, in the median raphé, from the scrotal fistula to within half an inch of the anus, giving issue to a couple of drachms of pus. The urethra was opened upon the groove of the staff, loops of silk passed through the edges of the cut and held on each side by an assistant, enabling me to have a good view of the staff and black guide, when, with my small beaked knife, I divided completely the stricture and a little uncontracted canal behind, and guiding the staff into the bladder, urine flowed freely. No. 13 sound introduced; diluent, quinine and iron continued.

No catheter was retained, but a No. 12 conical steel sound was passed every second day. He had no chill, no fever, and was up and out in two weeks. He sailed for Panama March 21, 1869, the wound having nearly healed, and promised to use his instrument once a week.

I heard from him a month after; he reported the wound healed and his general health excellent.

CASE XXXI.—Stricture of long standing, partly from traumatic cause, partly from gonorrhœa (mixed)—Constant dribbling from overflow—Threatened retention—External perineal urethrotomy with a conductor—No catheter retained—No urethral fever—Good result.

James H., aged 24, a laborer, of intemperate habits, was admitted to Bellevue Hospital, September 10, 1866, on account of dribbling of his urine.

He stated that when between five and six years of age he received an injury, the nature of which he could not recollect, but remembered being taken by his mother to a medical man, who tried to intro-

duce instruments for some difficulty he had in "making his water." He was very positive that, from the time of his earliest recollection to the date of his first and only gonorrhœa, which he contracted six years previous to his entry into the hospital, he had passed a very small spiral stream, and that it had always taken him a long time to empty his bladder. The attack of gonorrhœa was very severe, and he was much annoyed by painful chordee. A gleet ensued which lasted nine months.

He contracted syphilis a year before admission, and some of its traces, in the shape of copper-colored spots, were still visible in the lower extremities. He had also induration of the post-cervical and inguinal glands, and was undergoing a course of mercurial treatment when I took charge of him.

He began to suffer from overflow of urine about a year prior to admission, and had steadily grown worse.

He complained of pain in the hypogastric and lumbar regions, got up three or four times at night, strained very much in his attempts to relieve himself; passed only a small spiral stream, with considerable scalding, and was on the verge of retention.

On November 5th his urethra was carefully explored; No. 4 met with an impediment one-fourth of an inch from the orifice; No. 3 was arrested five inches back. A small bulbous bougie passed the second obstruction and met with a third at a point six and a half inches from the external meatus. The urethra was excessively sensitive.

The house surgeon had made numerous attempts to dilate these obstinate strictures, but had failed to pass any bougie larger than No. 1 flexible. I had myself made several trials, with no better result. During that time diluents were given freely and quiet enjoined.

As treatment by gradual dilatation had failed after having been fairly tested, during a period of seven weeks, and as retention was imminent, it was concluded to resort to the external division, but the patient refused to submit to the operation and left the hospital. He returned, however, within ten days, very much worse, and was then anxious for the operation.

On November 23d he was etherized, placed in the usual position, and a delicate filiform guide introduced. A No. 2 conical tunnelled staff was passed over the guide and carried down to the deepest stricture, six and a half inches from the meatus. It was still firm, unyielding, and would not permit the further progress of the staff. The instrument was held in position by an assistant, the perineal incision was then

made and the urethral canal opened in front of the stricture. A loop of silk was passed through the cut edge of the urethra on either side, and held by assistants; with this excellent contrivance of Mr. Avery's to keep open the incised canal, the point of a fine-grooved probe was readily engaged in the stricture and carried onward a little distance by the side of the guide. On this grooved probe the stricture was freely divided; the contraction, one inch or thereabouts in front of it, was likewise incised. The urethral cut, including the two strictures and a little sound tissue in front and behind, occupied a space of about two and a half inches.

The stricture near the meatus was also deeply incised, and Nos. 11 and 12 conical sounds were introduced.

The hæmorrhage was very slight; no catheter was retained; the urine was allowed to escape from the perineal wound; no chill or urethral fever followed; he made an excellent and speedy recovery and the wound healed within a month. Conical steel sound No. 12 (this being the capacity of his urethra) was introduced every third day, and then once a week. He remained under observation until June, 1867, was then passing a good stream, and had learned to introduce an instrument for himself.

He was readmitted to the hospital in June, 1868, suffering from a suppurating bubo, the consequence of chancroids.

I was then able to pass a No. 11 conical steel sound.

REMARKS.—This man's trouble originated in an injury of the urethra, during childhood, too slight to produce rapid diminution of its calibre, but contracting slowly and steadily. This was at length aggravated by the attack of gonorrhœa, which gave rise, also, to the two anterior strictures. The case therefore belongs to the mixed variety, having both the traumatic and gonorrhœal elements combined to constrict the urinary passage.

Confident as I was of the correctness of this view, I did not hesitate to recommend and to perform the operation. The danger of retention was, however, in itself a sufficient indication to warrant the procedure. The stricture five inches back was included in the division, though in time it might have been dilated.

CHAPTER IX

RETENTION OF URINE.

RETENTION of urine in the bladder may be caused by inflammatory swelling in the deeper part of the urethra, by stricture, by impacted calculi or other foreign bodies in this canal, by enlarged prostate, by urethral abscess, by paralysis of the bladder, or by pelvic tumors. It is, however, retention of urine from stricture of the urethra which is especially treated of below.

Retention is *complete* when not a single drop of urine can be forced out, and *incomplete* when a very small stream is passed or the urine dribbles. There are three periods in retention from obstruction of the urethra; 1, dysury, when the urine is voided in a diminutive stream; 2, strangury, when it escapes only in drops with much straining; 3, ischury, when none can be passed.

Complete retention of urine occurring during the early stages of urethral obstruction—*acute retention*—is attended with excruciating pain, great mental agony and much agitation of the nervous and vascular systems. Owing to these urgent symptoms, relief is usually sought and obtained before the urinary organs have undergone much damage. When, however, no succor has been procured within three days, the urethra may burst behind the seat of obstruction, during a violent straining effort, giving rise to extravasation of urine; the bladder itself may be ruptured—an accident, happily, of very rare occurrence—or the urine continuing to accumulate until the fifth or sixth day, anury or suppression of urine may follow and the patient die in consequence.

Incomplete Retention of Urine.—There are fewer deaths from complete (*acute*) retention than from the incomplete, which is very properly called *chronic* retention of urine—since it often exists many months. Most of the patients who die in consequence of obstructed micturition are first attacked with dysury. The bladder does not empty itself completely and the residual urine becomes stale and ammoniacal and gives rise to cystitis. There is constant retention of urine, though some may be passed hourly in a small stream or in drops, or it may continually dribble involuntarily. The bladder, being called upon to do so much extra duty, in repeated efforts to force the urine through the obstructed canal, in time undergoes concentric hypertrophy. These symptoms come on so gradually and insidiously that often the patient himself is not aware of the gravity of his condition until he is in a hopeless state. There being an impediment in front, the urine regurgitates into or is retained in the ureters and renal pelves, which become greatly engorged—at times bursting, and occasionally being dilated to such an extent as to resemble small intestine. Nephritis may ensue and abscesses be eventually formed in the kidneys, and the patient die of pyæmia or from suppression of urine.

When urine has long been retained in the bladder, a tender and fluctuating tumor is observed in the hypogastric, sometimes extending even above the middle of the umbilical region. From a few pints to several gallons of urine have been discovered in the human bladder, though it is rare to find more than four pints. Eight pints were drawn from one of my patients before I saw him (Case 8, Chapter V.). Civiale mentions the remarkable instance of a young primipara who from the time of her delivery was troubled with severe abdominal pains; she had urinated frequently, but little at a time. The existence of an abdominal tumor led to the belief that the uterus was enlarged,

but as this tumor gradually increased to the extent of being felt above the umbilicus, and besides was fluctuating, its real nature was finally suspected, and to verify the diagnosis a catheter was introduced and about three gallons of urine drawn.* Boyer cites the case of a young man, suffering from retention due to paralysis of the bladder caused by injury of the spine, from whose bladder, after death, eighty pounds of urine were taken.

Retention of Urine from Inflammatory Swelling in the Urethra.—A condition, usually called “acute inflammatory stricture,” causing retention of urine, has been correctly ascribed, by Sir Henry Thompson, to inflammatory swelling of the prostatic portion of the urethra, from debauch and exposure during the decline of gonorrhœa. “This condition of the prostate,” he says, “resembles that which affects the tonsils, and which we call inflammatory sore throat.” As the urethral swelling increases rapidly, the stream of urine becomes at once very small, and there is soon complete retention, with excessive pain—owing to over-distension of a *healthy* bladder—great agitation, and considerable febrile reaction.

In former times patients suffering in this way were treated with opiates, hot baths, and leeches to the perinæum; all of which are very good, but are certainly insufficient to relieve the present distress. Prompt and efficient succor is now given in these cases by the immediate use of the catheter without any damage being done to the urethra, and is accomplished by the cautious introduction of a well-oiled No. 6 or 7 gum catheter—either the French olive-pointed instrument, or the English plain one-eyed catheter. The metallic stylets which are usually found in English instruments should, in such cases, on no account be used, but the catheter should be warmed, properly curved, and then cooled

* *Maladies des organes Genito-urinaires*, Vol. 3, p 227. Civiale cites this case as reported by Blumenthal.

in water, and it will retain its curve long enough to be introduced successfully. If the soft catheter will not enter the bladder readily, it is highly improper to thrust it hither and thither into the urethra and cause hæmorrhage, but it should at once be withdrawn and a heavy No. 7 conical steel catheter substituted, and, giving it the right direction, it will glide into the bladder by its own weight. The amount of urine drawn in such a case is from two to three pints. Rest and diluent drinks should be ordered for a day or two, and there will probably be no recurrence of the trouble, as subsidence of the swelling may be confidently expected under such a course of treatment.

Retention due to Stricture of the Urethra may be complete—not a drop of urine passing—or incomplete and attended with dysury, strangury, or dribbling from overflow; the latter, a condition too often confounded with incontinence of urine—*i. e.*, *inability of the bladder to retain any urine at all*—is of rare occurrence, while the dribbling of urine from over-distension of the bladder is very common, and is an almost sure indication of retention of urine.

Treatment.—If the stricture causing retention be permeable, catheterism should be employed as the best means of immediate relief; if impassable, external perineal urethrotomy should be performed without delay, with the double object of relieving the bladder and curing the stricture. Catheterism is often successful with small gum instruments, No. 1, 2, or even 3; the flexible rubber tube of an aspirator, attached to the distal end of the smallest catheter, will greatly assist in withdrawing rapidly the accumulated urine; but occasionally we find cases of greater difficulty from narrowness or eccentricity of the constriction. I shall quote from my clinical lectures of December 8 and 15, 1869—published in the *Medical Record*—a case of extreme difficulty, witnessed by the class, as it will serve better than anything

else I can now say to illustrate what I conceive to be the most efficient manner of dealing with retention of urine, and at the same time curing the stricture.

In undertaking the management of such a case, the duty of the surgeon is, first, to ascertain the cause of the retention of urine; secondly, to take proper means to relieve the over-distended bladder; and, thirdly, to resort to the safest and best method at his command to prevent recurrence of the trouble. To arrive at a correct diagnosis it is necessary to take into account the previous history of the patient as well as his present condition, and to make a careful exploration of the urethral canal.

CASE.—J. W. W. is a married man, thirty-three years of age, who has always enjoyed good general health; his build is that of a healthy man, but he has a pallid and bloated face, with some puffiness of his lids. He has long been addicted to the excessive use of ardent spirits. He has never passed any gravel, nor has he ever suffered any injury of the urethra; but he has had three attacks of urethritis,—the first, fifteen; the last, thirteen, years ago; all uncomplicated and cured in a short time, with the exception of the last, which was followed by a gleet discharge that has lasted to the present moment. Ever since the last urethritis he has noticed a gradual but steady diminution in the volume and force of his urinary stream. He has also, for thirteen years, been troubled with irregular chills, which have become quite frequent for the past three years. During the last-mentioned period he has had no regular jet, but has passed his urine guttatim, with much straining and great frequency, often once every fifteen minutes. Strong drink always aggravates his trouble, and on several occasions, after debauches, he has had attacks of urethral hæmorrhage. For the last four weeks the urine has dribbled from him constantly, day and night, save that twice within that space of time he has had complete retention, once lasting half a day, and once an hour and a half, relief coming spontaneously on both occasions. For the last four or five years his urine has appeared muddy and has contained a copious sediment, and at times has been alkaline. Latterly he has suffered much from pain in the hypogastric region, accompanied by a constant desire to micturate, which could not be pro-

perly gratified. He has also complained of shooting pains in the groins and thighs.

REMARKS.—You have learned from the brief history just narrated that the patient has never suffered from calculous disease, and that the retention of urine came on gradually, not suddenly, as would have been the case if a calculus had lodged at the neck of the bladder, or in the urethra; therefore you will naturally exclude that, as you will also the presence of any other foreign body, as a cause of obstruction. You will also remember that he has sustained no injury of any kind to produce impediment to the flow of urine. If, moreover, you take into account his previous good health, his age, and the fact that his gonorrhœas were uncomplicated, you will as readily exclude obstruction from disease of the bladder or prostate. There only remains, then, for consideration some morbid alteration of the urethral canal, and you will have every reason to look for this if you bear in mind that the patient has had repeated attacks of urethritis, the last followed by a persistent gleet, which is one of the prominent symptoms of stricture of the urethra. But as yet you have only had the patient's statement as evidence—very good so far as it goes, and of great assistance; but you must have something more positive, more tangible, on which to base a diagnosis. You should neither express an opinion nor venture to apply a remedy in such a case until you have thoroughly analyzed all its points, and have resorted to direct exploration of the urethra.

Let us first take a general survey of the patient, and then bring to bear the exploring instruments. You notice that this man's shirt is saturated with moisture, and if you were close enough you would not fail to perceive the offensive urinous odor which emanates from his person. Notice also, if you please, the well-defined tumor which extends from the pubes up above the level of the umbilicus, and which, as you are now able to hear, is flat under

percussion; this is the distended bladder, which must be relieved of its burden. You observe that the prepuce is abnormally long, red, and sodden, from the action of the constantly-flowing urine.

The perinæum shows no swelling, induration, or any other sign of rupture of the urethra. Another fact worthy of your attention is, that he does not now complain of any uncomfortable sense of distension in the region of the bladder; it is because this organ has been so long filled and is so much overstretched that it has lost its sensibility. It will be found also, when the urine is drawn off, that the bladder has, in a great measure, lost its contractility. This investigation of the case will remain incomplete and unsatisfactory until mechanical exploration of the urethra has been resorted to, by which the most reliable evidence will be obtained. How is this to be accomplished? Which of the several methods is the simplest, readiest, and safest?

Be advised, and do not attempt to introduce a metallic instrument for the purpose of exploring the urethra in a case like this, for you will learn little, if anything, while you may do mischief to the patient; and remember that if a full-sized instrument can be passed with ease through the whole length of the urethra, you must look for some other cause of retention than stricture of the canal.

Here is an instrument which you have frequently seen me use in this lecture-room; it is commonly known among us as Leroy d'Etiolles' "bougie-à-boule" (bulbous bougie); it is soft and pliable, with an "acorn-shaped" swelling at the extremity.

This bougie, which is six millimetres in diameter at the largest part of the bulb, corresponds to about No. 9 of the English scale.—You see that it readily enters the meatus, but is now arrested and will go no farther.—It is withdrawn to make way for a smaller one, and by measurement the obstruction is found to be situated one-third of an inch from the external orifice.—Here is

another bougie, four millimetres and five-tenths in diameter, about equal to No. 6.—With very little pressure it has passed the stricture ;—in withdrawing it and measuring again it is found that the constriction is a quarter of an inch in length.

If you take into consideration the degree of permeability of the stricture which has just been explored, you will naturally conclude that it cannot be the real source of the retention of urine, and that there must be another constriction farther back. The same instrument will therefore again be introduced ;—it is arrested at a distance of four inches, and will make no farther progress.—I substitute the smallest bougie, but it only goes one inch farther back. It is not possible to estimate the length of this stricture, because the smallest bulbous instrument has only penetrated it for the distance of one inch, and cannot pass beyond ; the narrowing may extend back another inch, for all we know. This man's urethra has become so narrow at the seat of disease that less urine flows from the bladder than enters it, consequently the longer interference is delayed the greater will be the accumulation, and relief must come speedily or the bladder or urethra will burst.

Now that the diagnosis has been made, or, in other words, that the nature of the impediment to micturition has been ascertained, let us see what means can be contrived for the relief of our patient. An effort must be made to enter the bladder through the natural channel, without cutting, if possible ; but in any event the urine must be drawn off.—Puncture of the bladder, either through the rectum or above the pubes, is at best but a palliative, as it does not remove the urethral obstruction, and besides it is by no means free from danger ; it should therefore be rejected.

If the stricture in this case happens to be impassable to the smallest bougies, it can be reached by incision through the perinæum. But this must not be thought of until all attempts

to get through it have absolutely failed. In order to facilitate the manipulations upon the deep-seated stricture, the constriction situated one-third of an inch from the external orifice should first be attacked. Experience has taught us that strictures at the meatus or in the fossa navicularis are not amenable to treatment by dilatation or by divulsion; in fact any such attempts made upon them are not only ineffectual, but result in greater subsequent contraction. These strictures are best treated by deep incision, which may be made with an ordinary bistoury, or with this concealed knife, which Civiale has called his “urethrotome à bascule.”

I shall introduce this “urethrotome à bascule,” or “bistouri caché,” and incise the stricture from behind forward along the floor of the urethra, and include the meatus in the incision, stopping only short of making a hypospadias, in order to allow for the contraction which will follow upon cicatrization.—You see that there is no longer any hindrance to the passage of the largest instruments. The hæmorrhage is very slight, and will cease spontaneously. I am now ready to commence proceedings against the deeper stricture, and as it has been found exceedingly narrow, it must be dealt with accordingly. First, the urethra will be filled with oil, and then the smallest instruments, such as you see upon the table, will be employed.—Here are the little whalebone bougies, already so familiar to you.—From them I select a straight one, half a millimetre in diameter.—It will not go, as you see, very far beyond five inches.—It must be left *in situ*, that three or four more may be successively passed by its side.—But this does not seem to succeed.—Now this one, which is spiral at its extremity, will be tried.—It appears to enter the bladder;—it moves freely;—but I must satisfy myself that it has reached its destination. The others will be removed, and further exploration will be made with the finger in the rectum.—Pressure made with

the point of the finger, in the direction of the posterior surface of the triangular ligament, prevents the instrument from being moved backward and forward. When the finger is withdrawn, you see how easily and freely it moves. This is a pretty satisfactory evidence that it has gone in the right direction. A very important fact is incidentally ascertained by this rectal exploration. It is, that the urethra is dragged upward by the distended bladder, which has become too large for the pelvic excavation, and has been forced up into the abdominal cavity after the fashion of the gravid uterus. What is to be dreaded from this circumstance? The urethra, whose course is greatly changed, has been put so much upon the stretch that even the slightest force would tear it across, or an instrument carried in with any degree of pressure would make a false passage, which would extend back between the prostate and rectum, where urine would escape and cause extensive pelvic cellulitis, with probably a fatal result. You can therefore understand with what caution and gentleness such a case must be handled, and you see, from the difficulties just experienced, that it would, after failure of the usual modes of catheterism, have been considered as a case of impassable stricture, demanding either puncture of the bladder or external perineal urethrotomy without conductor; but with the method employed it will be made quite tractable. The most important and difficult step of the operation was accomplished when the slender whalebone guide-bougie or conductor was coaxed through the strictured portion of the urethra. This first step succeeding, the others will be comparatively facile. I know of no simpler or more effective mode of catheterism than this. When you have failed with the ordinary methods, have recourse to it, and I am sure you will seldom be disappointed. Always lubricate with oil the urethra instead of the instruments; I consider this essential to success. You should have in your case of

instruments at least a dozen of these whalebone probe-pointed conductors, of the length of ordinary gum bougies, and about half a millimetre in diameter—equal to No. $\frac{1}{8}$, or thereabouts, of the English catheter scale. Some should be straight, some spiral, some with the point bent at a little less than the angle indicated (Fig. 50).

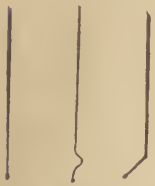


FIG. 50.

Now that the bladder has been entered by the guide-bougie, a little preliminary dilatation should, if possible, be made before attempting to introduce the retention catheter* (Fig. 51), which is three millimetres in diameter, nearly corresponding to No. 3 of the English scale, and is conical, its point being two millimetres in diameter, about equal to No. 1 of the same scale. A groove on its convex side extends a distance of four inches, and is bridged over in its last twelfth of an inch, so as to form a canal for the reception of the whalebone guide. The catheter eye is on the concave side of the instrument, about three-fourths of an inch from its point, and is kept closed by a well-fitted stylet. Its curve is equal to one-fifth of the circumference of a circle three inches and a quarter in diameter.

This preliminary dilatation—sometimes divulsion occurs—is, I believe, best accomplished by the aid of the grooved steel staff (Fig. 52), two millimetres in diameter at its point, which is tunnelled for one-eighth of an

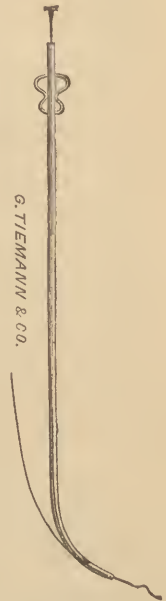


FIG. 51.—The author's tunnelled catheter.

* For a full description of the manner of using the retention catheter, see Medical Record, May 15, 1869.

inch. If the free end of the guide-bougie, which already occupies the whole length of the urethra, be passed through this tunnel or canal, the staff, as it advances, must follow the guide-bougie.—The point of the instrument now rests against the face of the stricture; there it will be held firmly, but no force will be used. In a few moments it will probably pass the obstruction. If it should not, cutting should be resorted

to without delay.—But you observe that it has made some progress.—It has entered the still more constricted portion of the canal, and has reached a point six inches from the external meatus. It will at once be replaced by a larger one (two and a half millimetres in diameter).—This also goes in.—Now I am ready to introduce the evacuating catheter in a similar way, and, of course, with great caution, for it is necessary to pass that portion of the urethra which, as before remarked, is so much displaced as to be very easily injured.—You see that the urine is flowing through the instrument, but without force, for the bladder has lost much of its expulsive power; it must not, therefore, be completely emptied. This basin now contains three pints of urine, and, judging from the volume of the abdominal tumor, there is still probably the same amount in the bladder. This must

FIG. 52.—The author's tunnelled staff.

be removed gradually, for the walls of the viscus have been too long overstretched to warrant its sudden evacuation. It may be several weeks before it recovers from its state of atony.

If the patient is left as he now is,—with the stricture but partially dilated, or rather only to a slight degree divulsed,—it will probably be impossible within twenty-four hours, owing to inflammatory swelling, to pass an instrument and draw off the

urine, without running great risk of doing mischief. Therefore the wiser course to be pursued will be to enlarge the urethra forthwith at the seat of stricture, so as to facilitate the introduction of one of the largest sounds. You might ask, Why not treat the case by continuous dilatation? Why not, at least, tie in a soft catheter for only twenty-four hours? Either plan might be adopted under certain circumstances; but there is nothing, at present, to be gained by temporizing, and it is of such long standing as to demand immediate interference; besides, a longitudinal rent of the narrowest part of the strictured urethra has already been made by the conical instruments that have been passed, as shown by the slight hæmorrhage which has occurred; and surely there is no additional risk to be run in enlarging that rent—why not do so at once and save time and trouble?

To effect this I shall resort to the method known as divulsion.

Here is a divulsor which I have modified from Sir Henry Thompson's pattern. You see that it is constructed on the same plan as the instruments before introduced, having a short canal at its extremity. The guide is now engaged in the canal, and the divulsor is being passed into the urethra, so that the portion of the instrument which is susceptible of greatest expansion may correspond as nearly as possible to the narrowest part of the stricture: this is probably about five and a half inches back. Now, observe how rapidly the expansion is being made;—this separation of the two longitudinal halves of the instrument can be effected very slowly or with great rapidity, at the option of the surgeon; sometimes it is best to operate slowly.

The divulsor has reached its greatest point of expansion, and the strictured portion of the urethra can now admit with ease No. 18 sound of the English scale. As the instrument is withdrawn you will perceive that its two segments are not completely approximated, they are in fact only half closed: this precaution

should always be taken, for sometimes, especially if the instrument is not carefully made, the urethra is pinched up between the closed segments, and in pulling out the divulsor a portion of the mucous membrane is torn away.

The hæmorrhage, you see, scarcely exceeds a drachm. Observe, if you please, how easily this No. 16 sound slips into the urethra and enters the bladder. No anæsthetic has been used, because I thought it was necessary that I should be guided by the patient's sensations.* He was very nervous and irritable, his urethra was very sensitive, but he suffered more from anticipation than from the real pain. You will almost always succeed in managing such a patient to your satisfaction by kind words and a light hand. He will now be sent to bed, and the after-treatment will consist of free doses of quinia, ten grains of which, with a quarter of a grain of morphia, will be given at once. To-morrow he will begin to take ten-drop doses of tincture of the chloride of iron. It is a mistake to give more than ten drops of this drug three times in the twenty-four hours; often I give but five drops at a dose. Many administer twenty or even thirty drops at a time, but this is a waste of material; besides it is very apt to derange the digestive functions, and to give rise to annoying constipation and other unpleasant disorders. His urine will be drawn at regular intervals until his bladder is quite emptied, and then the organ will be injected twice a day with tepid water, until it regains its power of contractility and the cystitis has subsided. Then once every third day a full-sized steel sound will be passed."

December 15th.—"This patient appears here again, in accordance with the promise I made to you at the close of our last meeting. You will recognize in him the man who was suffering

* In only one instance, out of many operations, have I been obliged to administer an anæsthetic.

from prolonged retention of urine consequent upon stricture of the urethra. I propose now to report upon the progress of the case, and endeavor to estimate the value of the mode employed for his relief, and to ascertain what, if any, advantage it possesses over other methods.

On the evening of the operation the patient had a slight chill, which was not, however, followed by fever. On several prior occasions, simple catheterism had, in his case, been followed by similar but even more severe rigors. On the following day his skin was warmer than normal and his pulse one hundred to the minute. He was also suffering pain in the hypogastric region, from over-distension of the bladder which was nearly as full as before the operation, though, during the night, he had passed, involuntarily, a considerable quantity of urine, and no catheter had since been introduced. At about mid-day, a gum catheter was passed and three pints of urine drawn; the instrument was then plugged and retained in position, that some might be drawn off every two hours without subjecting him to the pain of frequent catheterism; at about ten o'clock P.M. the bladder was completely emptied, and the catheter was removed. I would advise you to pursue this plan under similar circumstances, but the instrument should not be retained upwards of twelve hours. On the third day the patient passed some urine at will, but afterwards most of it was taken from him by means of the catheter, morning and evening, after which the bladder was injected with two ounces of tepid water.

A red and painful swelling had made its appearance at the extremity of the prepuce, from infiltration of a drop or two of urine through the connective tissue of the frænum which had been involved in the incision of the meatus--the frænum in this case extends unusually far forward. This tumefaction of the prepuce increased until the fifth day, when fluctuation became

distinct, and the abscess was opened. The same occurrence had been observed in an analogous case some years ago, and had led me to make the incision a little to one side of the frænum in several others, by which this accident was avoided; but in this instance it had not occurred to me to carry out the plan.

The urine has been drawn off, and the bladder injected twice a day regularly. The cystitis is improving on this account, and also because the source of obstruction has been removed. The organ is rapidly regaining its power of contractility, and the patient is now (the seventh day) able to empty it without the aid of a catheter. He gets up but once at night and four times during the day, and passes a normal stream of urine. The bladder will be injected once in the twenty-four hours for a few days more. He has had no chill since the occurrence of the rigor on the evening of the operation. As the case was one of great emergency, and as it was necessary to proceed at once to its relief, there was scarcely time to investigate it so closely as I have since been able to do at leisure. You will remember that your attention was called to the puffiness of his lids and to his pallid and bloated face. Subsequently, his legs and feet were noticed to be slightly œdematous, and it was ascertained, on close questioning, that he had been subject to headaches, dizziness, and photopsia. All this led me to have his urine carefully examined. Here is the report of Dr. Curtis (Acting House Surgeon), who made the examination.

The urine was acid, with a specific gravity of 1011; it contained abundance of albumen—due, however, to the presence of a considerable quantity of pus. Microscopic examination revealed the presence of hyaline casts.

We have now to cope with this additional serious complication, renal disease, which would have hastened to a fatal termination had the patient's bladder remained unrelieved, and had rupture

of the urethra and extravasation of urine occurred. But it may now be fairly said that he has taken a new lease of life; and if he continues to be prudent and sober, his kidney affection may remain quiescent for years. His urethra is rapidly losing its extreme sensitiveness, and is in fact quite tolerant of the sound, as you see by his present behavior under catheterism. Please to observe also that the instrument (No. 13) meets with no impediment whatever, and that it has fairly entered the bladder. The incision made near the extremity of the prepuce is covered with healthy granulations and will soon heal entirely. The necessity of using a steel sound, of the size just employed, once a week for life, has been urged upon him, and it is to be hoped that he will follow the advice."

In cases of great urgency, where the stricture is impassable, puncture of the bladder is still resorted to by many surgeons with the idea that in thus turning the current of urine the strictured part is rendered permeable and amenable to dilatation. The principal methods of puncture of the bladder are the supra-pubic, the inter-pubic, the sub-pubic (Voillemier's method), and the rectal. I shall not here give any description of the manner of doing these various operations, since I cannot conscientiously advise their employment, so long as there are more efficient and safer modes of relief.* I may add that I have never punctured a bladder, though the operation was once done with my sanction, by one of the house surgeons at Bellevue Hospital.

A mode of relief preferable to puncture of the bladder is Molins's operation† of tapping the *urethra* in the perinæum, described by Wiseman, and afterwards by Dionis, and revived and

* Supra-pubic puncture with a capillary trocar, aided by the aspirator, has taken the place of these various modes of puncture of the bladder, and should be employed in cases of emergency. See chap. xii.

† Wiseman, *op. cit.*, Lib. viii., cap. vi., pp. 538, 539.

improved by Mr. Edw. Cock, of London. Mr. Cock was at first a partisan of the rectal puncture, but he has discarded it for the better and safer method which is described below in his own words.

Steps of Mr. Edw. Cock's operation of "tapping the urethra at the apex of the prostate, unassisted by a guide-staff."

"The only instruments required are a broad double-edged knife, with a very sharp point; a large probe-pointed director, with a handle; and a canula, or a female catheter modified so that it can be retained in the bladder. The patient is to be placed in the usual position for lithotomy; and it is of the utmost importance that the body and pelvis should be straight, so that the median line may be accurately preserved. The left forefinger of the operator is then introduced into the rectum, the bearings of the prostate are carefully examined and ascertained, and the tip of the finger is lodged at the apex of the gland. The knife is then plunged steadily but boldly into the median line of the perinæum, and carried on in a direction towards the tip of the left forefinger, which lies in the rectum. At the same time, by an upward and downward movement, the vertical incision may be carried in the median line to any extent that is considered desirable. The lower extremity of the wound should come to within half an inch of the anus.

"The knife should never be withdrawn in its progress toward the apex of the prostate; but its onward course must be steadily maintained until its point is in close proximity to the tip of the left forefinger. When the operator has fully assured himself as to the relative positions of his finger, the apex of the prostate, and the point of his knife, the latter is to be advanced with a motion somewhat obliquely either to the right or to the left, and it can hardly fail to pierce the urethra.

"If in this step of the operation the anterior extremity of the

prostate should be somewhat incised, it is a matter of no consequence.

“In this operation it is of the utmost importance that the knife be not removed from the wound, and that no deviation be made from its original direction until the object is accomplished. If the knife be prematurely removed, it will probably, when reintroduced, make a fresh incision, and complicate the desired result.

“It will be seen that the wound, when completed, represents a triangle; the base being the external vertical incision through the perinæum, while the apex, and consequently the point of the knife, impinges on the apex of the prostate. This shape of the wound facilitates the next step of the operation.

“The knife is now withdrawn, but the left forefinger is still retained in the rectum. The probe-pointed director is carried through the wound, and, guided by the left forefinger, enters the urethra and is passed into the bladder. The finger is now withdrawn from the rectum; the left hand grasps the director, and along the groove of this instrument the cannula is slid until it enters the bladder.

“The operation is now complete, and it only remains to secure the cannula in its place with four pieces of tape, which are fastened to a girth round the loins. There will probably be no escape of urine until the stylet is removed from the catheter. A direct communication with the bladder has now been obtained, and the relief to the patient will be immediate. Unless the kidneys have become irremediably disorganized, we may confidently anticipate a favorable result; and the restoration of the urinary organs will be more or less complete, in proportion as the obstructed portion of the urethra is more or less amenable to the ordinary judicious treatment of stricture. The cannula may generally be retained in the bladder for a few days, and if the state of the urine renders abluion necessary, the viscus may

be frequently washed out. The canula may then be removed, cleaned and reintroduced.

“A flexible catheter is sometimes more desirable and congenial to the feelings of the patient than a metallic catheter. To keep the artificial passage in a permeable state, it is generally necessary to pass a flexible bougie through the opening occasionally, and to retain it in situ for a few hours. The patient very soon learns to do this for himself.” *

This mode of dealing with retention of urine, due to impassable stricture, is, I think, especially indicated in urgent cases when the medical attendant may not be within reach of the instruments necessary to perform external perineal urethrotomy. The surgeon may be called at night, too, when the paramount indication of relieving a greatly over-distended bladder having been fulfilled in this manner,† the patient is made comfortable until the following morning, when, with the aid of a good light, external perineal urethrotomy can be satisfactorily performed.

While a strong advocate of Mr. Cock's excellent method, I think it best, in daytime at least, after the introduction of a capillary bougie or a fine-grooved probe from behind forward through the constriction, to divide the whole of it freely. This, certainly, will not materially add to the shock of the first step and will insure a more speedy cure of the stricture.

Before closing this chapter I will give the account of a case of retention of urine—from a very unusual cause—to illustrate one of the uncertainties of rectal puncture of the bladder.

* On the means to be adopted for establishing a communication between the bladder and the exterior of the body, when the urethra has become impermeable. By Edward Cock, Esq., etc., Senior Surgeon to Guy's Hospital. See Guy's Hospital Reports, vol. 12, p. 267, and Braithwaite's Retrospect. London, 1866. Vol. 54, pp. 210, 216.

† Supra-pubic capillary puncture, aided by pneumatic aspiration, will hereafter be used in such emergencies.

Case of retention of urine, caused by a single diseased kidney, situated in the pelvic cavity, for the relief of which rectal puncture was done, the trocar passing to the right of the bladder and entering the kidney—Death on the fourth day after the operation—Autopsy—Remarks.

Peter McG., a healthy-looking, muscular man, aged 24, was admitted to Bellevue Hospital, September 20, 1870. Three days before, he thought he was in good health, but in the evening was seized with pain in the hypogastric region, and a friend, supposing him to be suffering from colic, gave him some gin and advised his lying prone: from these means he obtained relief. On the following day he went out, but was seized with severe pain, and soon returned and summoned a medical gentleman, who, finding the patient suffering from retention of urine, introduced a catheter, but no water flowing, he thought he had failed to enter the bladder. Several other gentlemen saw the case and used instruments, but as no urine escaped by the catheter, they also thought the bladder had not been reached. In the evening of the second day—the patient being still unrelieved—the operation for puncture of the bladder through the rectum was done. Not much urine flowed, and the canula was at once removed. On the afternoon of the third day he was sent to the hospital, where I first saw him. There was a fluctuating hypogastric tumor, dull under percussion, and giving the idea of a distended bladder. A No. 15 bulbous bougie was passed into the bladder and met no obstruction in its course; a No. 10 silver catheter was then introduced, and eight ounces of urine were drawn off, but the hypogastric enlargement did not subside. By rotating the catheter to the left, nothing abnormal was detected, but on the right it came in contact with a resisting object which seemed to have pushed that wall of the bladder almost to the median line.

I expressed the opinion that the tumor was extra-vesical, and had encroached upon the cavity of the bladder to the extent of giving rise to the urgent symptoms of retention. An elastic catheter was retained, the distal extremity plugged, and the stopper ordered to be removed every two hours. The patient though partially relieved grew worse—peritonitis having set in—and died on the third day after admission to the hospital.

Autopsy nine hours after death.

Thoracic viscera normal. Liver slightly enlarged and fatty. Spleen enlarged.

General peritonitis, most marked in the pelvis, where the organs were

glued together. All the intestines but the rectum having been carefully removed, no kidneys were found in the lumbar regions, and no renal arteries could be detected in the usual place. Within the pelvis, and rising above the brim, between the sacrum and bladder, more to the right than to the left, was a tumor the size of a child's head, filled with fluid. This tumor was accidentally cut into, and, as the fluid (urine) escaped, it partially collapsed. The dissection necessary for its removal revealed the fact that it derived its supply of blood from the middle sacral artery, which was much enlarged. There was a single large vein emerging from the tumor, and emptying into the ascending cava. A healthy undistended ureter was traced from the hilus of this single and abnormally placed diseased kidney to the bladder. The tumor, the rectum, and the bladder were carefully removed in mass, the urethra being severed under the pubic arch. The bladder presented no morbid appearance other than a few punctate spots of congestion in its mucous membrane, and there was no evidence of any puncture in its lower fundus or anywhere else. The rectum being laid open from behind, its parietes were found greatly thickened. Through its anterior wall, two and a half inches from the anus, there was a punctured wound which was traced into the substance of the kidney and its distended pelvis; the trocar having passed to the right of the bladder without wounding it.

REMARKS.—The notes of this case, though incomplete, do not detract from its great interest and from the lesson it teaches. It is extremely instructive anatomically, physiologically, and pathologically, but it will here be considered chiefly in its surgical aspects.* There was not only retention of urine in the bladder, but also in the pelvis of the kidney, which latter was caused by compression of the short ureter, partly by the tumor itself and partly by the distended bladder. Whenever the patient changed his position to the prone, the tumor would be thrown forward and out of the pelvic cavity, relief of the bladder following, the pressure upon the ureter would be removed, the urine would again

* The acting house surgeon, Dr. Schuyler, found it impossible to obtain a complete history of this case, and was allowed but little time, comparatively, for the autopsy, the friends being desirous of removing the body at once.

gush into the bladder, and, as this filled up, retention of urine in the renal pelvis would again occur.

It is the frequent recurrence, for months, perhaps years, of retention of urine in the bladder which probably gave rise to this extreme distension of the pelvis of the kidney. Had the patient often assumed the prone position he would doubtless have obtained more relief, and perhaps his kidney would have remained normal; but its situation in the pelvic excavation was never suspected. Anatomists have occasionally found one or both kidneys in this locality, but, so far as I know, this anomalous position of the organ has never caused retention, and the case may, in this respect, be considered unique. It is not, therefore, to be wondered at that we all failed to appreciate the true nature of the case until after the autopsy.

A gentleman present at the autopsy asked, "What are the signs by which such a 'mal-position' of the kidney can be discovered, especially when, as in the case in point, there is retention of urine?" My answer was,—“Taking the case under consideration for an illustration, the signs would be: 1st, pain in the hypogastric and sacral regions, also in the perinæum and rectum, with a sense of weight and perhaps tenesmus, even after successful catheterism of the bladder; 2d, absence of pain in the lumbar regions; 3d, dulness in the hypogastric region; 4th, absence of renal dulness in the lumbar regions on careful auscultatory percussion; 5th, no subsidence of the hypogastric tumor after successful evacuative catheterism of the bladder.”

The important lesson learned in this case is, that the attempted operation of rectal puncture of the bladder—which here gave rise to fatal peritonitis—was resorted to under the impression that the whole trouble was retention of urine in the bladder from obstruction of the urethra, and this conclusion seems to have been arrived at without proper exploration of that canal. Had a bulbous

bougie been passed, as the first step of mechanical exploration, the canal would have been found permeable to the largest instruments; puncture of the bladder would not have been entertained for a moment; and possibly a correct diagnosis would have been made.

There is one more point to be considered in this case. It will be remembered that the hydronephrosis was quite extensive after death, as if the relief of the bladder had at last failed to remove the obstruction of the ureter, due latterly to compression by the kidney, which was becoming more and more distended, and if the patient had not died in consequence of the puncture, he would have surely died from rupture of the renal pelvis or from suppression of urine. Let us suppose that a correct diagnosis be made, what would then be the treatment in such an instance? If another like case—but without previous interference—were to present itself, and relief could not be obtained by postural treatment, I would endeavor to establish a direct communication between the distended pelvis of the kidney and the bladder, by passing into the bladder, per urethram, a No. 14 curved metallic catheter, open at its vesical extremity, turning the point against the bulging wall of the bladder, holding the instrument firmly in position, and thrusting in an articulated trocar of proper length; after the withdrawal of the trocar, and on the appearance of urine, insinuating, as rapidly as possible, a No. 10 or 11 gum catheter, also open at both ends, through the metallic instrument, which I would then remove, secure the soft catheter in position for a week, and draw off some urine at regular intervals until the subsidence of the watery tumor. After a week the gum instrument might be changed every second day, over a whalebone guide of double length, until the fistulous track should be lined with mucous membrane derived from the pelvis of the kidney and from the bladder. Such a device is, I think, worth trying for the relief of what must certainly end fatally without it.

CHAPTER X.

RUPTURE OF THE URETHRA AND EXTRAVASATION OF URINE—URETHRAL FISTULÆ—RUPTURE OF THE BLADDER.

WHEN retention of urine remains unrelieved, the urethra is likely to burst behind the seat of obstruction,—the fluid escaping into the neighboring connective tissue, and constituting what is termed *extravasation of urine*,—or the bladder may be ruptured.

Before the urethra gives way, it has generally undergone the process of attenuation described in Chapter I. The rupture takes place during a violent straining effort and the urine gushes out into the surrounding connective tissue, the perinæum becoming swollen and tense, and, as the fluid is prevented from gravitating down the thighs,—by the superficial fascia which is firmly bound to the rami of the pubes and ischia and to Poupart's ligaments,—it takes a forward and upward direction into the scrotum and penis, which become enormously distended in a very short time. As more urine is forced out of the bladder, the infiltration extends to the hypogastric, and sometimes to the lumbar regions and even up the thorax.

Ordinarily, when a patient suffering from extravasation of urine is questioned, he says that while tortured with uncontrollable fits of straining during retention, he felt something give way suddenly, and at once experienced relief, but was surprised that no urine had come away, and that in a few moments this relief was succeeded by great depression, nausea, faintness, and swelling of the scrotum. The effect of the extravasated urine upon the tissues with which it comes in contact is to destroy

them, and the gases resulting from their decomposition give rise, when the parts are handled, to an emphysematous crackling. A few hours after extravasation of urine in the scrotum, the skin becomes tense, assumes an erysipelatous redness which soon changes to a purple and then a dusky hue, and, unless the tension be promptly relieved by incision, within twenty-four or thirty-six hours the invaded skin becomes gangrenous, and when the slough falls, the testicles are left denuded, and supported only by the spermatic cords.

CASE.—In the latter part of 1851 I saw a badly neglected patient who was brought to Bellevue Hospital, suffering from stricture, retention, and consequent extravasation of urine in the scrotal, hypogastric, umbilical and the iliac regions; all these parts were black and gangrenous, the skin being nearly ready to drop off, and when the sloughs came away there was left such an extensive granulating surface that I thought, at the time, it would never be covered; but to my surprise this all healed and the man made a good recovery.

The existence of a black, gangrenous spot upon the glans penis is a sure sign that the urine has insinuated itself into the spongy substance. This occurrence is regarded as the worst omen, if not as an almost certain indication of a fatal issue. Usually the patient is in a state of muttering delirium, with a very feeble and frequent pulse, and a dry and brown tongue.

In the Treatment of this dangerous complication, prompt, energetic and efficient measures should be adopted. The prime necessity is to support the sinking vital powers with stimulants and concentrated and easily digested food, while at once free incisions are made wherever the urine has worked its way, to give it issue and to relieve tension. This admits of no delay whatever, for the sooner these indications are fulfilled the less sloughing will occur, and the sooner will the poisonous excretion be got rid of, and consequently the greater will be the chances

for life. In some instances it is better not to wait even to administer an anæsthetic, for the surgeon may have to cut through tissues which have already become insensible to pain.

A word more regarding the incisions: one or two are usually made on either side of the scrotal raphé, and another in the median line of the perinæum, but inasmuch as the bladder, in these cases, is seldom completely relieved and that it may again become greatly distended, I think it good surgery—providing the patient be seen within twenty-four hours of the occurrence of extravasation—to make at once external perineal urethrotomy with or without conductor; in the latter case to divide the stricture upon a grooved probe and empty the bladder with the aid of a gum catheter introduced through the wound. The free and early division of the stricture will, I am sure, prevent loss of substance of the urethra in many instances. This is, I am well aware, heterodox according to the rules laid down by most of the best authorities at home and abroad, but I can conceive of no logical reasons why the stricture should not, in the majority of cases, be at once divided.

I think that while this proceeding does not in the least increase the severity of the case, it saves valuable time and obviates the necessity of a second operation. In any event a free, deep, central perineal incision should be made, to afford a more direct and easy escape of urine from the urethral rent.

As soon as the parts have been thoroughly cleansed, they should be enveloped into a large warm poultice, covered with a thin layer of carbolized linseed oil, which should be renewed every three or four hours, and the patient kept warm and clean. When the sloughs begin to loosen, there is a profuse discharge of very fetid pus, the escape of which it is important to facilitate in every available way. It is well, when the edge of a portion of dead skin can be lifted, to clip it off and to insinuate the

nozzle of a small syringe underneath, and throw in some warm carbolized water or any other antiseptic. By early and free incisions, the greater part, and even the whole, of the scrotum will often be saved.

URETHRAL FISTULÆ.

In cases of extravasation of urine requiring free incisions in the perinæum, scrotum, hypogastric region, the nates, thighs, or in all these regions, if the stricture be fully dilated or be incised and large sounds be afterwards regularly introduced, these cuts will generally all heal in the course of a few weeks. Otherwise there will remain one or several orifices, with pouting lips, corresponding to each wound. These cloacæ are the mouths of sinuous tracts or canals communicating with the urethra, giving issue to pus and urine and called *urethral fistulæ*. Though there may be a number of fistulous tracts in one individual, they usually all converge to form a single internal or urethral orifice. Where there exist many external fistulous orifices, the scrotum and other surrounding soft parts are apt to become greatly deformed and indurated, and to contain cavities in which pus and urine linger and sometimes give rise to calculous concretions. Such cases are extremely obstinate and require the greatest patience and attention. Urethral fistulæ do not always take their origin from extravasation of urine; they often arise from abscesses which may result from ulceration of the urethra behind strictures; from false routes; from peri-urethral abscesses which first open externally but finally establish a communication with the canal; or they may result from loss of substance, and this is particularly the case in the ante-scrotal or pendulous portion of the urethra.

Treatment.—Thorough dilatation or incision of the strictured urethra, or both combined, as before mentioned, will soon be followed by cicatrization in the great majority of instances of simple

fistulæ. But in cases where there is much induration of the scrotum and perinæum, it is necessary, in addition to dilatation, to direct the treatment to the fistulous tracts themselves. Among the best modifiers are injections, in the fistulous channels, of strong tincture of iodine or concentrated tincture of cantharides and if these means fail the fistulæ may be freely laid open to the urethra and dressed with picked lint to secure union by granulation. Besides the local, a constitutional treatment appropriate to the condition of the patient should always be resorted to.

It is not good practice to attempt to close *perineal* fistulæ which result from loss of more than one-third the circumference of the urethral canal. The wiser plan, in such an instance, is to maintain the patency of the opening, that urine may be voided through it without pain or straining. This course is especially indicated in fistulæ depending upon occlusion of the urethra following contusion of the perinæum in children.

Urethro-rectal and urethro-recto-perineal fistulæ are, in my experience, rare as consequences of stricture. I have seen only two cases, one of which, having been mistaken for *fistula in ano*, was treated by incision into the rectum. When I saw the man there was a perineal opening and an indurated cicatrix extending to the anus, and a very small orifice in the rectum, communicating with the membranous portion of the urethra. As the patient was in the second stage of pulmonary phthisis, and as only a drop or two of urine passed into the rectum during each act of micturition, I did not think any cutting operation advisable, and recommended simple dilatation of the urethra. At last accounts little if any urine was passing through the rectal opening, but the perineal fistula was still patent. The other patient got entirely well from persistent dilatation of his stricture: in this case also the rectal orifice of the fistula was very small, and the perineal opening was the last to close. It is only in large recto-urethra.

fistulæ that gas and fæcal matter are voided with the urine by the natural outlet: in these cases the opening should be closed with silver wires, after denudation of its edges, as in vesico-vaginal fistulæ.*

Ante-scrotal fistulæ may be caused by sloughing from extravasation of urine, or by loss of substance from mechanical injury, such as wounds, and the prolonged retention of catheters. Sloughing sores and the injudicious use of caustics in chancres have given rise to this lesion. The cure of such fistulæ is rendered very difficult, partly from the character of the tissues surrounding them, partly from the liability of erection of the penis. Numerous methods of urethroraphy and urethroplasty have been recommended, but none are likely to succeed, except those which supply the deficiency of mucous membrane by the substitution of skin—which is so readily convertible into mucous membrane—that is, the flap of skin intended to cover the fistulous opening must be lined with skin, even when the loss of substance involves only one-third the circumference of the canal.

RUPTURE OF THE BLADDER.

Rupture of the bladder, though an extremely rare accident in consequence of retention of urine from urethral obstruction, will here form the topic of a few remarks and suggestions, based principally upon the observation of two cases which came to my notice at Bellevue Hospital within five months of each other.†

CASE I.—John S., aged sixty, was admitted to Bellevue Hospital June 13, 1870. This man was muscular and of large frame. He denied having ever contracted venereal disease, and asserted that he

* A case successfully operated upon in this manner is reported by Dr. J. C. Nott, in the New York Med. Journ., Vol. 12, No. 2. September, 1870. p. 173.

† Both these cases were published by Dr. Thomas K. Cruse, in a paper on "Rupture of the Bladder dependent on Stricture of the Urethra as a Primary Cause." See Medical Record, vol. 6, No. 11, p. 241, August, 1871.

had received no injury of the genitals. Twelve years before, however, he had a retention of urine of thirty-six hours' duration, of which he was relieved spontaneously, catheterism being unsuccessful.

When he entered the hospital he walked up to his ward without assistance, and stated that he had passed no urine for three days. Examination of the parts revealed extravasation of urine in the scrotum, penis, and perinæum, which were much swollen and of a dusky red color, the extravasation having taken place twelve hours after the beginning of retention. On the glans penis there was a well-marked indurated cicatrix. Though the bladder had risen to the level of the umbilicus, the patient complained of no pain, his countenance bore no marks of suffering or of anxiety, and his pulse was ninety-four and full. A short time after his admission, a No. 8 flexible catheter was passed down the urethra to a point seven inches from the external orifice, where it was arrested; No. 2 bulbous bougie stopped at six and three-quarter inches; No. 4 encountered an obstruction at seven inches, overcame it and went three-quarters of an inch beyond. A filiform bougie could not be introduced past the latter point. Two hours after this examination, ether was administered with the view of making another trial at catheterism. The patient became greatly excited, and during one of his struggles the abdominal tumor suddenly disappeared, and the former area of dulness became tympanitic. Catheterism again failed. There were no symptoms of collapse; the pulse remained as before. Four hours later the integuments of the penis and scrotum were freely incised, a poultice applied, and an opiate given. Pulse 104 and feeble. From this time the patient made no motion or any sound to attract the attention of his nurse, and was found dead a few hours after the incisions had been made. I did not see him during life, but had the good fortune of witnessing the autopsy, which proved extremely interesting. There were in the abdominal cavity five pints of bloody urine, and a very slight glutinous exudation on the visceral peritonæum. The bladder was large, its walls were of normal thickness, and its cavity contained a little urine. At the upper fundus, posteriorly, there was a laceration half an inch in length, involving the peritonæum—there being no signs of ulceration. The penis, scrotum, and the tissues in and around the perinæum were infiltrated with bloody urine. Near the bulbo-membranous junction there was a slight constriction of the urethral canal, and just behind this point the urethra was *torn completely across*. The kidneys were fatty and granular.

REMARKS.—The first question that arises, in the consideration of this case, is, whether the retention of urine was the result of the stricture, which was permeable to a No. 8 instrument, or whether it was caused by the laceration and consequent retraction of the severed urethra. There is no doubt in my mind that the latter is the more probable solution of the mystery, especially if it be noted how little dependence can be placed upon the testimony of a man who, having the remains of a chancre upon his penis, denies that he has ever contracted venereal disease or has ever had a sore upon his privates. There is every evidence that this man had received a severe contusion of the perinæum, and that he probably had a motive in concealing the fact. He might have sustained an injury from the hand of some person whom he did not wish known, or possibly had been hurt during a drunken brawl, and had no recollection of it. However this may be, the autopsy proved beyond a doubt that there was a complete laceration of the urethra at the bulbo-membranous junction. In his case, this could only have occurred from contusion of the perinæum; and it is well known that such an accident soon leads to retention and extravasation of urine. The laceration of the urethra explains the discrepancy in the measurements, and also the failure of catheterism. The No. 8 gum catheter reached a greater depth than No. 2, simply because, being more resisting, it forced its way farther out of the canal into the neighboring connective tissue. None of the bougies passed ever entered the retracted vesical end of the urethra.

The second question relates to the vesical rupture. Judging from the duration of the retention (three days) and from the degree of distension, the bladder must already have become atonied. A good evidence of the correctness of this view is, that the man suffered no pain at the time of his admission, and was able to walk up-stairs. Consequently the rupture of the bladder

was not the result of straining in micturition, but was caused by violent contraction of the abdominal muscles during the patient's struggles while undergoing etherization. I think that any other anæsthetic agent would probably have had the same effect. The first wrong was to give any anæsthetic at all, the second was to delay treatment. The indications for immediate surgical interference were clear. There was a man whose bladder was distended to the umbilicus, who had not made water for three days, and who for two days had all the signs of extravasation of urine in the perinæum and scrotum. Should there have been a question about the propriety of making free incisions to *relieve tension*?

The duty of the young practitioner, in such circumstances, is to meet the immediate demands of the case, *i.e.*, to relieve tension and to provide for the escape of urine, if he does not wish to take the entire responsibility of managing the case to its end. The patient should at once be firmly held in the lithotomy position—but should take no anæsthetic—and, with a sharp scalpel, a clean incision should be made in exactly the median line of the perinæum, extending from the scrotum to within an inch of the margin of the anus, and involving all the tissues down to the urethra. This would give free egress to the urine, and leave the patient in the best condition for any operative process that might be decided upon after consultation. If such a plan had been pursued in the case under discussion, there would have been no rupture of the bladder.

CASE II.—Charles D., aged 36, admitted to Bellevue Hospital October 31, 1870. Had two attacks of urethritis; the first, ten years, and the last, two and a half years before admission, but otherwise had enjoyed good health, and was temperate. For two years prior to his entry into hospital he suffered from dysury and from other symptoms of advancing stricture. On the 29th of October, at 6 o'clock A. M., he urinated without help, and at 10 A. M., while straining, felt "something give way within him," and experienced severe pain in the whole abdo-

men. There were no other symptoms, and he was able to walk and call upon a medical man, who introduced a catheter and drew from him six ounces of urine. The patient received no further treatment until his admission to Bellevue Hospital, when it was ascertained that he had not made water for forty-two hours. He then lay upon his back with the knees drawn up. The abdomen was tympanitic, tender, and painful; pulse 72.

Exploration of the urethra: Bulbous bougie No. 13 was arrested at two and a half inches from the meatus; No. 10, at three and a half, and Nos. 3 and 2, at six inches. A capillary whalebone bougie was introduced, and over it a tunnelled catheter, and six ounces of clear urine drawn off, but without affording much relief. Ordered a turpentine stupe, and one-quarter of a grain of sulphate of morphia every two hours.

My term of service expiring, I turned the patient over to my successor for the ensuing two months, Dr. Stephen Smith, through whose courtesy I was enabled to see the man every two or three days to the termination of the case.

November 1st.—The patient passed a sleepless night, but in the morning was found in good general condition. Tongue moist; pulse 108; tympanites undiminished. Tenderness most marked in the inguinal regions. Filiform bougie and No. 7 gum catheter; six ounces of limpid urine drawn, and the instrument retained in position. Catheterism was difficult on account of an existing false route on the left side of the upper urethral wall. General symptoms the same. Pulse 104 and full. Morphia continued. On the next day there was, in addition to the great distension of the abdomen, an appreciable redness, with extreme tenderness, in the right iliac fossa; pulse 108 and weak. No urine passed through the catheter for seven hours. The instrument having been taken out to be cleansed, a No. 6 was substituted. Eight ounces of urine were drawn, and the catheter retained as before. The morphia was continued, and milk punch ordered. To relieve tension, several small incisions through the skin and superficial fascia were made in the hypogastric and inguinal regions, and a poultice applied.

On the fourth day his general condition was good, and he was free from pain. Pulse 108; respiration 20. More incisions were made at points where there was tension. The retained catheter, though withdrawn and washed daily, had already given rise to much urethral and vesical irritation.

On the sixth day his pulse was 96, his respiration 18, and he passed through the catheter sixteen ounces of clear alkaline urine.

On the seventh day he was very hopeful, and apparently in good condition. There was a notable diminution in the size of the abdomen. In the morning the pulse was 84, and the respiration 24. In the evening, pulse 108, full and soft. No. 9 gum catheter retained. Morphia continued.

On the eleventh day the instrument was withdrawn on account of troublesome cystitis and urethritis, and, by advice of Dr. Smith, a catheter was introduced every two hours. In the evening, during catheterism, the patient experienced a sudden pain in the bladder, followed by a few drops of blood. On the occurrence of this accident, the catheter was retained as before. Morphia suspended.

On the twelfth day, though he had a free stool, the tympanites began again to increase. Pulse 96. Urine passed freely through the catheter. In the lower part of the hypogastric region there was an indurated and painful mass—the beginning of an abscess. Slight diarrhœa.

On the thirteenth day he had a chill, followed by fever and sweating. The catheter, being clogged, was withdrawn, cleansed, and replaced. Ordered quinine and tincture of the chloride of iron.

On the fourteenth day he felt easy. Catheter withdrawn and passed every two hours. Urine ammoniacal and glairy.

On the eighteenth day he was allowed to micturate without assistance. Urine flowed in a good stream and without pain.

Nineteenth day. Micturition, accompanied by a slight pain in the bladder. Sweating profusely. Tumor of abdomen softening. During the night, micturition painful and very frequent. On the next morning the catheter was introduced and retained. The patient thought he experienced relief from the presence of the catheter.

Twenty-fifth day. On the previous night the patient removed the catheter, which was clogged. There was then some straining in micturition, and pain referred to the right iliac region. Epididymitis on the left side.

Twenty-ninth day. The abscess, which was pointing a little above the situation of the right abdominal ring, was freely opened, and discharged a quantity of fetid pus mixed with urine. Urine dribbled constantly through the opening, none escaping by the meatus urinarius. Catheter again retained.

The urine continued to flow from the mouth of the abscess, the lips

of which were ragged and indurated. The catheter was finally removed. The patient was tortured with constant vesical tenesmus, nausea, hic-cough, and delusions. He then failed rapidly, and died on December 13th, the forty-fourth day after admission and the forty-sixth after the accident.

AUTOPSY.—Lungs, liver, spleen, and heart normal. Peritoneal cavity: Firm bands of adhesion between the anterior abdominal wall and the cæcum and sigmoid flexure of the colon. Kidneys: There was marked anæmia of the capillaries, both in the cortex and in the pyramids. Well-defined spots of interstitial nephritis. Intense pyelitis and ureteritis. Bladder: This viscus was contracted to the size of a small orange. Its walls were half an inch in thickness, the hypertrophy being especially marked in the muscular coat. Its mucous membrane was thrown into numerous columnar folds. The cavity of the organ was half filled with thick, chocolate-colored and intensely ammoniacal urine. The rupture was in the anterior wall, about the middle of the vertical diameter of the bladder, and a little to the right of the median line. The opening in the mucous coat was somewhat rounded, and large enough to admit the index finger. The muscular and fibrous coats showed a vertical laceration an inch in length. A probe passed through the laceration could be moved freely in all directions; and on cutting down upon the instrument, through the abdominal wall, a cavity was seen which, commencing in front and to the right of the bladder, extended around to the left, beneath the peritonæum, and between the bladder and rectum. The walls of the cavity were tense, and it contained some fetid urine such as that found in the bladder. A probe, passed through the external hypogastric opening, entered the bladder through the laceration.

REMARKS.—This patient succumbed from the effects of pyelitis and nephritis, caused by extension of inflammation from the bladder through the ureters. Was not this the result of the prolonged retention of the catheter? Would not the chances of recovery have been greater under a different plan of treatment? I was partly responsible for this case, and now regret that I did not operate within a few hours after his admission.

When the rupture occurs anteriorly, or at the lower part of the

bladder, beneath the peritonæum, the lateral section of lithotomy should be made as recommended by Dr. Walker, of Boston; and, if there be a tight stricture, it should be included in the cut; but even the free perineal outlet is, I think, insufficient. A supra-pubic incision, as that for epicystotomy, should also be made, with a view of giving exit above as well as below to the extravasated urine. In the case of Charles D. there was great need of an early supra-pubic incision, for nature finally almost established it.

Rupture of the bladder, in consequence of retention of urine due to stricture of the urethra, is of such uncommon occurrence, that out of seventy-eight cases of vesical rupture—sixty-seven of which were males—collected from various sources by Dr. Stephen Smith,* only four are reported as being “caused by stricture.” Dr. Cruse gives the history of an additional case (fatal) of Sir Everard Home’s, not incorporated in Dr. Smith’s table. Dr. A. V. Williams reports a successfully treated case of rupture of the bladder from stricture.† These, together with the two cases that occurred at Bellevue Hospital, make a total of only eight—five having terminated fatally—which can be fairly attributed to stricture. In the majority of Dr. Smith’s tabulated cases, the rupture was caused by external violence applied to the hypogastric region while the bladder was full.

The following analytical summary of seventy-eight cases of rupture of the bladder, borrowed from Dr. Smith’s paper, will show at a glance the important features of this lesion from all causes.

Sex.—Males, 67; females, 11; making about six of the former to one of the latter.

* A Contribution to the Statistics of Rupture of the Urinary Bladder, with a Table of Seventy-eight Cases. By Stephen Smith, M.D., Assistant-Surgeon to Bellevue Hospital. Reprint from the New York Journal of Medicine, March, 1851.

† New York Medical Times, January, 1855.

Age.—Under ten, 3; ten to twenty, 3; twenty to thirty, 19; thirty to forty, 26; forty to fifty, 7; fifty to sixty, 4; above sixty, none; adults, 16, age not given.

Condition.—Bladder distended, 30, of which 10 were intoxicated; 5 from stricture,* intoxicated; condition not given, 14; parturition, 4; in good health, 4; doubtful, 2; no note of 24.

Causes.—Direct violence, 48; concussion, 15; internal causes, 9; of which 4 were parturition; 4, results of stricture; 1, retroversio uteri; no note of 6.

Primary Symptoms.—Severe, 59: of which 43 were ruptured into the peritoneal cavity; 2, not involving the peritonæum; 10, into cellular tissue; 3, not given. Slight, 9: of which 7 were into the peritoneal cavity; 1, indefinite; no note of 7. Inability to urinate, 28: of which 22 were into the peritoneal cavity; 1, not involving the peritonæum; 5, into the cellular tissue. Power to void urine, 3: 2, into the peritoneal cavity; 1, not involving the peritonæum. Power of locomotion, 7; all through the peritonæum. Felt a sensation as of the bladder bursting, 7.

Progress of Cases.—Severe symptoms continued in 48: of which 39 ruptured into the peritoneal cavity; 7, into cellular tissue; 2, peritonæum not involved. Severe symptoms set in, 10: in 1, three hours after the accident; 6, two days; 2, four days; 1, three days—all ruptured into peritonæum except last. In 1, power to urinate continued, the rupture being into cavity of abdomen. In 14, it came on: in 12 of these, on the second day; 9 being into the peritonæum; 2, not involving peritonæum; 1, into cellular tissue; in 1 on third day; in 1 on the fourth day. Locomotion continued in 2, both ruptured into peritonæum. Bloody urine drawn in 25; clear, in 4. Symptoms were mild in 2; both ruptured into cellular tissue.

* One case, being doubtful, is rejected.

Result.—Died, 73: within five days, 39; 26 being ruptures into the peritonæum; 9, into the cellular tissue; 3, not given. Between five and ten days, 22: 17, into the peritoneal cavity; 3, into cellular tissue; 2, not involving peritonæum. Between ten and fifteen days, 2: both into cellular tissue. Between fifteen and twenty days, 3: 1, into the peritoneal cavity; 2, into cellular tissue. Above twenty days, 2: both into cellular tissue; of which 1 lived forty-two days.

Recovered, 5: 3 into cellular tissue; 1, into peritoneal cavity; 1, partial.

Post-mortem Appearances of Viscera.—External marks of injury in 2, both ruptured into peritoneal cavity. No external marks of injury in 8: 7 ruptured into cavity of peritonæum; 1 not involving peritonæum. Fracture and injury of pelvis in 15: 11 ruptured into cellular tissue; 3 into peritonæum; 1 not given. Marks of inflammation in abdomen in 34: 27 being into the peritoneal cavity; 5 into the cellular tissue; 2 not involving the peritonæum. No marks of inflammation in cavity of abdomen, 7: 4 being ruptured into cellular tissue; 3 into cavity of abdomen.

Post-mortem Appearances of Bladder.—Ruptured into cavity of peritonæum, 50: 39, the result of direct violence; 6, concussion or indirect violence; 4, from parturition; 2, stricture; 1, retroversio uteri. Rupture in the anterior wall of the bladder, 9: 5 being from direct violence; 3, concussion; 1, stricture. Rupture at neck, 6: 5 from direct violence; 1, not given; no bladder found, 2; bladder firmly contracted in 17.

I shall not discuss the question of pathology, as it has been so fully treated of by Drs. Smith and Cruse, except to say that I agree with the latter regarding “ulceration,” which I think very rarely, if ever, precedes rupture; the last-named lesion being almost always a real laceration, unconnected with any previous ulceration.

Prognosis.—I should not, in the face of Dr. Smith's statistics, be willing to go so far as Sir Henry Thompson, who says that "a recovery has never been known to happen, and can scarcely be regarded as possible."*

Case 39, in Dr. Smith's table, which is also the fifth case cited by Dr. Cruse, is a fair illustration of recovery from rupture of the bladder due to stricture. The patient had retention three days while at sea; he was suddenly seized with severe pain in the region of the bladder, followed by great prostration. In four days the cellular tissue surrounding the rectum came away in sloughs. He was then received into the Seamen's Retreat (Staten Island, N. Y.), where he was seen by Dr. Ward, who reports that the hand could be passed up to the sacrum and surround the rectum; and that two and a half inches above the anus there was a large opening in the anterior part of the rectum, through which all the urine was passed. The patient made a rapid and complete recovery.

Dr. A. V. Williams' case, of which the following is an abstract, is another instance of recovery from rupture of the bladder due to stricture of the urethra:—

Case of spontaneous rupture of the bladder.—Extravasation of urine into the cellular tissue between the bladder and walls of abdomen—Operation—Recovery.†

William M., aged 32, of spare habit of body, but of great endurance, had for several years labored under stricture of the urethra, with frequent desire to urinate, from irritability of the bladder. He stated that on several occasions he had been unable to pass any water for

* The Pathology and Treatment of Stricture of the Urethra, etc. 3d edition, London, page 268.

† New York Medical Times, January, 1855, p. 11 *et seq.* This case is quoted by Professor Paul F. Eve in his collection of remarkable cases in surgery, page 407; and also by Professor Willard Parker in a paper which he read before the New York State Medical Society, in 1867, on Cystitis and Rupture of the Bladder treated by Cystotomy.

several hours. On the 9th of June, 1854, Dr. Williams was called to see him, and learned that the patient had not passed any urine for two days; that on the morning of the 9th, when making a violent effort to relieve his bladder, he "felt a snap," as if something had given way in his belly; from which time he had no desire to urinate, but was troubled with "very great pain over the belly." The doctor tried to pass a catheter, but failed.—Bath; warm poultice; anodyne. Diagnosis, rupture of the bladder.

Dr. Willard Parker was summoned in consultation, and it was agreed to make an incision above the pubes, cut into the bladder and pass a catheter, if possible, from within outward, through the penis, and re-establish a passage in that way. It was decided not to cut through the perineum, "as the extravasation was above the pelvic fascia."

The urine flowed out abundantly from the wound. There was but little hæmorrhage. The bladder was deep, and firmly contracted behind the pubes, and so altered in appearance that it could not be recognized as that organ. The doctor pushed up the peritonæum with one finger, and, with a bistoury, punctured the bladder, which Dr. Parker had drawn up with a hook; on dilating this opening with the finger, the internal surface was found corrugated and thickened. The urethro-vesical orifice could not be felt, so that the original design of forcing a passage from within outward could not be carried out. Whilst the finger was retained in the bladder, Dr. Parker passed a grooved sound into the urethra down to the strictured part, and forced it onward until the point was felt by the finger through the thickened coats of the bladder. A cut was then made through the bladder, upon the end of the sound, with a probe-pointed bistoury passed along the finger. The lips of the wound made in the abdomen were brought together by a single suture; a catheter introduced, through the false passage made, into the bladder, an anodyne given, and the patient sent to bed. Urine flowed freely through the wound and through the catheter. With the exception of some local peritonitis, which was readily controlled, the case progressed to a favorable termination without any other serious complication. On the twenty-seventh day the wound had entirely closed, and the urine was passed through the urethra in a fuller stream than it had done for years.

I do not urge here, as additional evidence, Mr. Keal's case,* of

* Case 29 in Dr. Smith's table.

recovery from this accident, because the rent did not extend entirely through the bladder. The termination of the case will depend much upon the seat of rupture. When it involves the peritonæum, a rapidly fatal issue may usually be expected, but when the rent is in the inferior and anterior part of the body or near the neck of the bladder, the patients generally survive some weeks, and, under proper treatment, sometimes get well.

The Early Symptoms of rupture of the bladder are similar to those of rupture of the urethra, *i.e.*, a sensation of something giving way within, and a sudden relief from the extreme distension, are experienced, though no urine is voided in the natural way; but there is no swelling of the scrotum, and the sinking of the vital powers is more pronounced, and death may take place in consequence within a few hours; although, as Dr. Smith says, the symptoms may be slight or even absent. Succeeding the collapse there is "intense pain in the hypogastric region, a great desire, but incapacity to expel urine, rapid and feeble pulse, hot skin, thirst." Later there may be symptoms of peritonitis, of pelvic cellulitis, or of both. It is not possible, at first, to ascertain whether the distended bladder has poured its contents into the peritoneal cavity, or among the meshes of the pelvic connective tissue.

The degree of collapse may be an indication, but this should not be too much relied upon. If the rent be large, as in John S., the urine suddenly, and in great abundance, gushes into the peritoneal cavity and produces fatal collapse; if there be but a small aperture, only a part of the retained urine is forced out, and that gradually, too, as is sometimes the case in rupture at the anterior part or near the neck of the bladder.

Treatment.—The therapeutic indications in vesical rupture are: first, to prevent accumulation of urine in the bladder, and consequently further escape of the fluid into the surrounding areolar tissue, or into the peritoneal cavity; secondly, to remove

the urine from the peritoneal cavity, or to provide for its escape from the meshes of the pelvic connective tissue; thirdly, to support the vital powers; fourthly, to relieve pain—by free doses of opium—and to control inflammation. In case of rupture into the peritoneal cavity, Dr. Blundell recommended “the making of an opening above the symphysis pubis so as to withdraw the urine, and the thorough ablution of the cavity and its contents by means of the free injection of distilled water at ninety-eight degrees F.” Then “to close the laceration with a ligature, and drawing up the bladder to the abdominal opening, etc.” This operation has never been performed, and is as unpromising and unsurgical as paracentesis abdominis under the same circumstances.

Dr. Harrison proposed the operation of paracentesis through the recto-vesical cul-de-sac, where the urine is apt to gravitate, but it does not appear that the method has ever been carried out.

In a case of vesical rupture from injury, with extravasation into the pelvic connective tissue, Dr. Walker of Boston has been successful in using the lateral operation, as for stone,* which he performed with the double object of favoring the escape of the extravasated urine and of keeping the bladder empty.†

Dr. Thorp mentions a case of rupture of the bladder by a fall from a horse, where he succeeded in passing a catheter through the laceration—after the instrument had traversed the whole length of the urethral canal—and drawing off the effused fluid and injecting warm water through the catheter to wash the peritoneal cavity. His patient recovered.

* The New York Medical Journal for August, 1872, contains an interesting article, by Professor Erskine Mason, on rupture of the bladder from violence, with an illustrative case successfully treated according to Dr. Walker's plan. The operation was performed by Dr. Mason about forty hours after the injury, and the patient discharged from hospital perfectly well on the thirty-ninth day.

† Observations on Rupture of the Urinary Bladder, by Henry Thorp, M.D. Dublin Quarterly, 1868, page 306.

The best manner, in my opinion, of dealing with a case of ruptured bladder from stricture is to divide the stricture, and, at the same time, to combine the methods of Dr. Walker and Dr. Thorp; that is, to make an external perineal division of the stricture, entering the urethra laterally, and carrying the incision to the neck of the bladder as in lithotomy, and then introducing a catheter through the wound to explore the whole cavity of the viscus until the rent is found, when the point of the catheter is to be insinuated through it. If urine escapes freely and in abundance, the inference is that it comes from the peritoneal cavity; otherwise it may be concluded that the extravasation has taken place in the pelvic areolar tissue. In either case the operation is not only justifiable, but, I think, offers better chances than any other plan proposed. Its advantages are, that it disposes of the stricture, provides for the thorough drainage of the bladder, forms an outlet for the extravasated fluid from the connective tissue and for the escape of matter, and is the best means of arriving at a correct diagnosis. It is certainly easier to find the rent with a catheter passed through a wound in the perinæum than with the same instrument introduced through the whole length of the urethra.

In cases such as Charles D., a supra-pubic incision below the peritoneal reflection will be needed as an additional outlet for pus and urine.

There is nothing to be gained from puncture of the bladder; and if the stricture should be dilated or divulsed as in Charles D., the retention of a catheter for the purpose of drainage does not seem to fulfil the indication, and there can be no better instance, to prove its injurious effect upon the urethra, bladder, and kidneys, than the case of Charles D.

CHAPTER XI.

DISEASES OF THE PROSTATE.

THE prostate, surrounding as it does the urethro-vesical orifice, and playing such an important part in the function of urination, is almost certain, when diseased, sooner or later to impede the out-flow, and sometimes to give rise to retention of urine. This body is so frequently found in a diseased state, that it behooves us all to acquaint ourselves with its peculiar morbid conditions, and with the best modes of discovering and of remedying them.

The diseases which attack the prostate are, inflammation (acute and chronic); hypertrophy; atrophy; the formation of calculi; cysts; tubercle; and cancer. Only the first two affections, however, will be here discussed.*

ACUTE PROSTATITIS.

Acute prostatitis is usually the result of extension of urethritis, by continuity of mucous membrane, into the follicles of the prostate: its principal exciting causes being, exposure to cold; sitting upon damp ground; venereal and other excesses; the use of the irritating injections so often employed in the treatment of gonorrhœa; the incautious and too frequent introduction of instruments in the treatment of chronic urethritis, of stricture, or in sounding for other purposes.

* Those who desire full particulars of the anatomy, physiology, and pathology of the prostate are referred to the excellent works of Sir Henry Thompson; Messrs. William Coulson, and John Adams; Professor Gross; and Messrs. Civiale and Mercier.

Its prominent symptoms are, a sense of weight in the perinæum; increased frequency of micturition; pain at the neck of the bladder; and rectal tenesmus. Pressure in the perinæum, such as may occur when the patient assumes the sitting posture, causes pain which is keenly felt as far as the extremity of the penis. As in acute orchitis, the urethral discharge ceases as soon as the first symptoms of acute prostatitis show themselves. Later these symptoms are much aggravated; there is dysury and strangury; the urine is high-colored, acrid, and sometimes bloody; the vesical and the rectal tenesmus becomes almost insupportable, and finally complete retention of urine ensues. There is also obstinate constipation; and, in fact, defecation is rendered almost impossible, from encroachment upon the rectum of the greatly swollen prostate. The patient is distressed with pains in the lumbar regions and in the course of the sciatic nerves. Being unable to walk or sit, he takes refuge in his bed, exhausted with pain.

CASE.—In the fall of 1857, I had under my care a man twenty-eight years old, who exhibited the above-named symptoms in the highest degree, while affected with gonorrhœa. The index-finger could not be passed beyond the prostate, which almost completely filled the rectum. Defecation was impossible, and retention of urine, which had already supervened, rendered the use of the catheter imperative. The patient went to a hospital, where, as I afterwards learned, he suffered intensely for several days, when at length the mass softened, and the abscess was opened per rectum.

Termination.—The inflammation may terminate by resolution or by suppuration; the latter being manifested by rigors with febrile reaction, throbbing pains in the perinæum and rectum, in the course of the urethra to its extremity, and by complete retention of urine. The abscess does not usually point toward the perinæum unless it is peri-prostatic. It is directed either to the

rectum or the urethra, and very rarely, if ever, opens into the bladder. Most frequently, and naturally, too, it bursts into the urethra, in the vicinity of the *veru montanum*. If there be several small openings, all may go well, but if only one, and that large, there may ensue very grave consequences from the urine rushing into the cavity of the abscess.

CASE.—In 1864, a young man was brought to Bellevue Hospital suffering from retention of urine. The House Surgeon introduced a silver catheter, which met an obstruction in the region of the prostate after some pressure the instrument suddenly advanced about an inch, when two ounces of pure creamy pus flowed through the catheter, but the bladder could not be entered. From this time the bladder relieved itself spontaneously. The patient died with symptoms of pyæmia in the course of two weeks. At the autopsy there was found a ragged opening in the floor of the urethra, leading to a large cavity, with dirty sloughy walls, containing stale urine and pus, and the whole prostate was disorganized. Through this opening in the urethra, the urine had made its way into the cavity of the abscess, and had caused the damage above described.

Peri-prostatitis often occurs from injury, such as forced catheterism, producing a false passage, extending between the prostate and its capsule. I have seen, in all, six cases of this kind, and have now two cases under observation. In one, whose prostate, it is said, filled the lower part of the rectum, there followed extravasation of urine; and, before I saw him, nature had established a free opening through which a great amount of pus escaped; but in the other man there is a very copious discharge of pus per urethram, and he is so feeble and exhausted that a cutting operation is, for the present, contra-indicated.*

Treatment.—At the onset of the disease it is important to unload the bowels by administering a brisk saline cathartic, six

* The man has since died, and the diagnosis was verified at the autopsy.

or eight drachms of sulphate of magnesia in a tumbler of hot lemonade; and on the following three or four days, to keep up catharsis by doses of one scruple of sulphate of soda and two of sulphate of magnesia in three ounces of hot water, to which may be added, with advantage, one-eighth of a grain of tartarized antimony, every four hours. An anodyne at night is usually requisite, and diluent drinks should be freely exhibited during the day.*

Hot hip-baths for a few minutes, hot hop fomentations to the perinæum, and enemata of warm water, judiciously used, are very serviceable. Local depletion, by leeches to the perinæum and margin of the anus, is most advantageous in the early period of the disease. Leeches applied to the rectal surface of the prostate, through curved metallic or hard-rubber tubes, introduced per rectum, have been used by Bégin, Drs. Henderson and Craig, and by Dr. Hughes of Dublin, and the effect reported good; but inasmuch as one or two only can thus be used at a time, it is better to rely upon their external application to the number of ten or twelve. Local depletion, in the perineal and anal regions, proves of the greatest benefit, from the fact that it helps to unload the engorged prostatic plexus of veins which so freely anastomose with the hemorrhoidal veins.

While at the very outset of the trouble the surgeon should direct his attention to carrying out the measures best indicated to arrest or subdue inflammation, he should be sure not to overlook the existing retention of urine incident to the swelling of the prostate. The sufferer may assure him that he has been making water constantly, that he cannot even "hold his urine,"

* Sir Henry Thompson advises "full doses of alkali," the bicarbonate and acetate of potash: two or three drachms of the former and three or four of the latter in the twenty-four hours, sometimes doubling the dose, in strong subjects, with advantage.

which is dribbling away. In answer, he should explain to the patient that these symptoms are only delusive, that they "indicate retention, not incontinence," and that they demand immediate interference. The catheter must therefore be speedily used, bearing in mind, however, that much mischief may be done if the instrument be not rightly used. It is better, ordinarily, not to employ a metallic catheter for the purpose of drawing off urine in acute prostatitis. A small-sized (No. 6 or 7) soft gum catheter, properly curved,* and without the stylet, is the best instrument for this purpose. It should be well oiled, slowly and gently coaxed—*not driven*—through the urethra into the bladder, and, as soon as two or three pints of urine are drawn, should be carefully removed, to be again introduced every six or eight hours, until it is safe to dispense with it altogether, which may be in ten or twelve days.

When the inflammation terminates in suppuration and abscess, the latter, as before mentioned, may point toward the urethra, may there burst, or may be penetrated by the extremity of a catheter directed by a rough hand. Some surgeons have recommended the opening of prostatic abscesses through the rectum, but, in my opinion, this method should be avoided. There is, I think, a much safer and better route, viz., the perinæum, which can be freely incised, and form the best outlet for pus, and perhaps urine. If the abscess has already opened into the urethra, which is known by a sudden gush of creamy pus through the meatus, the operation described below may be done, with the object of giving free egress to pus, and of preventing accumulation and stagnation of urine in the cavity of the abscess. The patient, having been etherized, should be placed in the lithotomy posture upon a firm table; a broadly grooved staff introduced into

* See directions for curving gum catheters, Chap. XII.

the urethra and held in position by an assistant; a free external incision made, as for lateral lithotomy; the membranous urethra then opened, and the cut extended nearly to the base of the prostate, but without involving the neck of the bladder: or the medio-lateral operation may be substituted. If it should be desirable to incise both lobes of the prostate, it can be accomplished satisfactorily by the medio-bilateral operation, as above, without cutting the vesical neck.

The cavity of the abscess should then be cleansed by syringing in some warm carbolized water, and a tent saturated with carbolized oil left in the wound, in order to obtain union by granulation from the bottom. The urine should be drawn off at regular intervals by means of a gum catheter passed each time through the wound, and none allowed to escape spontaneously. If the operation should be undertaken before the abscess bursts, the same external incision should be made, and a careful dissection carried back to the prostate, and the abscess cut into freely without implicating the urethra; being careful at the same time to avoid the rectum.

I have operated upon two such cases with success.

The opening of these abscesses through the perinæum has been advised, but the importance of early, free, and methodical incision has not been urged.

CHRONIC PROSTATITIS.

This form of inflammation is much more common than the acute. It is so gradual and slow in its progress that it often remains undiscovered for months or even years, and its symptoms may be mistaken for those of some other complaint, or may be entirely overlooked. The same causes that operate to produce the acute, give rise also to the chronic form of this disease. To these

should be added masturbation ; venereal excesses ; hæmorrhoids ; calculi ; and the prolonged retention of catheters in the bladder.

Termination.—Chronic inflammation of the prostate may terminate by suppuration and abscess, or by enlargement ; the latter, however, should be distinguished from the disease known as senile hypertrophy. In the enlargement consequent upon inflammatory action, the glandular element principally is affected, while in the senile form the muscular element is mainly the seat of the disease. Then again the enlargement is inconsiderable in chronic prostatitis—which occurs most frequently in middle life and in early manhood—while in senile hypertrophy it is always marked, and sometimes very great. This disease may take its starting-point from the acute inflammation, or it may begin independently, as a low grade of inflammatory action, either from extension of cystitis, of chronic urethritis, or from a dilated and inflamed urethra behind a narrow stricture. Chronic prostatitis is, however, very commonly associated with senile hypertrophy, and is often caused by the necessarily frequent catheterism which is not always done with sufficient caution and gentleness. I have dissected six specimens of hypertrophied prostates which contained abscesses—generally multiple—but in one, a patient in whom a large and worn gum catheter had been passed twice a day for several months, there was a single abscess, involving the whole left lobe, which had opened in the urethra. In another case there was a short *cul-de-sac* with rounded edges—an old false route—on the left side of the floor of the prostatic sinus, and a second but deeper false passage on the right side near the median line, extending into the substance of the prostate. The left lobe was disorganized, and consisted of only a thin bag filled with pus. In the right lobe there were several small purulent foci.

Symptoms.—This morbid state is characterized by increased

frequency of micturition, with pain at the beginning and at the close thereof,—which so closely resembles the distress produced by stone, that, to exclude the latter, it is often necessary to use the sound,—dull pains in the perineal, anal, and lumbar regions, and in the hips and thighs; all aggravated by exercise. There is sometimes pain during coition, sufficiently severe to deter the patient from repeating the act even if he feels so inclined; but sexual desire is often abolished, and there may be frequent involuntary nocturnal emissions of semen. The patient becomes morose, retiring, and despondent; his general health soon suffers; his circulation is languid; his skin is dry; his extremities are cold; his digestion is impaired; his bowels are constipated; defecation is painful, and during the act there is a flow of viscid, turbid mucus from the urethra, sometimes amounting to a drachm.

Diagnosis.—Digital pressure per rectum reveals considerable tenderness of the prostate, and occasionally some enlargement. There is a more or less constant escape of muco-purulent matter from the urethra; the discharge is at times sufficiently abundant to be mistaken for gonorrhœa. An instance of this kind has lately come to my notice: the patient, a married man, forty-seven years old, had a few weeks previously consulted a prominent urologist, who told him that he had venereal urethritis, for which he should take oil of sandal-wood. As the subject of the troublesome affection in question—who was a man of correct habits—had not exposed himself to venereal infection, he concluded to seek advice elsewhere. He called upon me, stating that he had never had gonorrhœa, but had suffered from obstinate dysentery on several occasions; that for the past two years he had had some turbid, viscid urethral discharge, which was always aggravated by sexual intercourse, or too much exercise, and that on two or three occasions within two years, the discharge had become creamy and abundant, and resembled gonorrhœa. He was losing

the sexual desire, complained of pain in the loins, hips, perinaeum, and rectum, and of obstinate constipation ending always in an attack of diarrhoea. Micturition was too frequent, and was painful at the close of the act. He had in fact the symptoms of chronic prostatitis. Examination revealed granular urethritis in the region of the bulb, and the introduction of a bulbous bougie gave extreme pain when it entered the prostatic sinus.

It is an easy matter, in a doubtful case of this sort, to exclude acute urethritis, by simply introducing a hollow bulbous bougie, with three or four small perforations at the base of the bulb, as far as the membranous portion of the urethra, and syringing in warm water—the retrograde current of the irrigator washing out the whole spongy portion of the canal—and then to direct the patient to urinate into two separate glass vessels, the first two or three ounces of urine to be passed into one, and the remainder into the other vessel. The urine being turbid and flocculent in the first vessel, and clear in the second, will surely indicate the source of the pus.*

The pus originates partly in the prostatic ducts and follicles, partly on the mucous membrane of the prostatic urethra, which is, in the majority of cases, in a granular state, thus showing a considerable analogy with follicular *cervicitis* and the granular condition of the *os uteri*.

There is a very common form of chronic prostatitis—named by Professor Gross *prostatorrhoea*, in contradistinction from sperma-

* The mode of inspecting urine by making the patient micturate into two separate glass vessels, seems to have been first suggested and employed by Sir Henry Thompson, who very properly attaches much importance to it, as it serves to separate “purely urethral products from the deposits which come from the bladder or from the kidneys, and which are otherwise likely to be attributed to the latter sources, or at all events to be misunderstood.” *Diseases of the Prostate*, 3d edition. London. P. 63.

torrhœa—yielding, more especially during defecation, a copious, clear, or very slightly turbid viscid mucous discharge. This is a source of very great mental anxiety to certain patients, who imagine themselves the victims of seminal incontinence, and perhaps of impotency, especially when encouraged in this belief by ignorant and designing charlatans, into whose hands such unfortunates too frequently fall. The microscope very soon establishes the points of difference between the altered prostatic mucus and semen. The former contains epithelial cells and pus, with few if any spermatozoa, while the latter consists largely of spermatozoa.

The urethra at the seat of disease is usually very sensitive, and should be explored with the greatest caution with a *bougie-à-boule* of full size, the base of which will be found, on withdrawal, to be coated with muco-pus. I have often examined microscopically this purulent matter, but have never detected in it any spermatozoa.

The Treatment of chronic prostatitis should at once be directed to the restoration of the impaired vital powers, and be continued in conjunction with the surgical treatment proper. To that end tonics should be freely administered, the bowels kept open by means of small doses of sulphate of soda and of magnesia, or by the Congress, Kissingen, Pullna, or other aperient mineral waters; a nutritious but non-stimulating diet, diluent drinks, and abstinence from malt and spirituous liquors ordered. Moderate walking exercise should be advised. Among the best tonics are the chalybeates and quinine. I have often given, with good effect, the nitrate of iron, together with quinine and arsenic; but, perhaps, the best preparation I have used is the following formula, suggested to me by Professor Meredith Clymer, of New York, in doses of one teaspoonful, in a wineglassful of water, three times a day.

℞ :

Quiniæ Sulphatis, ℥ij.

Strychniæ Sulphatis, gr. j.

Acidi Arseniosi, gr. j.

Acidi Phosphorici Diluti, ℥i.

Syrupi Ferri Superphosphatis, ℥v.

M.

In cases attended with frequent seminal emissions, I have found much good to result from five drops each of tincture of chloride of iron, tincture of cantharides, and wine of ergot, taken three times a day, and continued for three or four weeks. When there is induration or engorgement of the prostate, the iodide of sodium in free doses is of service.

The strength of the patient permitting, an occasional Turkish bath should be advised. Three grains of iodoform, with half a grain of extract of belladonna, in a suppository of butter of cacao, introduced every night, will sometimes prove beneficial. Counter-irritation to the perinæum, by painting it with strong tincture of iodine, is an excellent adjuvant in the treatment of this affection. Vesicating collodium is, however, more effective, and should be cautiously applied, first to one side of the perineal raphé, and in three or four days to the other side, care being taken to prevent its running toward the anus or the scrotum. The blistered surface need not be of more than one finger's breadth, and should be immediately covered with a layer of raw cotton, to facilitate its drying up. Should it remain sore, a light dressing of cerate will obviate all inconvenience arising therefrom. This plan of flying blisters—*vésicatoires volants*, as the French call them—is best suited to the purpose, and, in a few weeks, will greatly help to bring about the desired result.

Steel sounds, introduced every third or fourth day in increasing numbers, and then gradual over-distention of the prostatic urethra

with the instrument represented at page 45, Fig. 17, have proved of great value in my hands for cases of granular urethritis extending to the prostatic region and giving rise to chronic prostatitis.

Another device worthy of trial, for expanding the prostatic urethra and vesical neck, is the hollow soft rubber bougie, with a thinner and weaker space of about two inches from the vesical extremity, capable of being increased to three or four times its original diameter by forcing in air, or injecting warm water. This instrument was in use some years ago in France.

But there are cases which are rather aggravated than benefited by the sound, and such cases should be treated by the application of ointments medicated with tannin, calomel, or other agents; or the solution of nitrate of silver may be used. Doctor Hutchison, of Brooklyn, has devised a serviceable catheter (Fig. 53) for the application of ointments as well as other medicinal substances in solution. For solutions, the graduated catheter (Fig. 54) is ordinarily used, but Dr. James Bigelow, of Brooklyn, has given the profession a much better instrument, perhaps the best in use (Fig. 55). Dr. Bigelow's "catheter syringe," for injecting nitrate of silver solution into the prostatic portion of the urethra, is described by Dr. Otis as follows:—

"By means of this ingenious instrument, both the measurement and the application are accomplished by a single introduction. The shaft encloses a double canal: one continuous with the barrel of the syringe, following the inner curve of the instrument, and terminating at the curved extremity of the shaft in a number of minute openings; the other canal continuous with the little branch-tube, and following the outer curve to the extreme end of the shaft. This (the catheter portion) is traversed by a wire which stops the opening at its extremity. On the introduction of this instrument, with the wire slightly retracted, at the instant of



FIG. 54. Catheter for injecting nitrate of silver in the prostatic sinus.

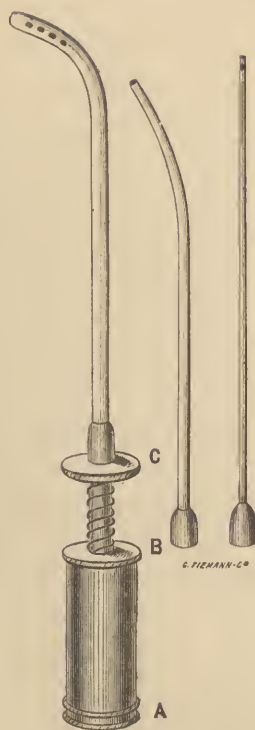


FIG. 53. Hutchison's catheter for applying ointments to the urethra.



FIG. 55. Dr. Bigelow's catheter syringe.

its entrance into the bladder a few drops of urine exude from the branch-tube; the wire stopper is then pushed in, the instrument withdrawn half an inch, and the piston driven home." *

The strength of the solution of nitrate of silver should be from five to twenty grains to the ounce of distilled water, rarely more, and the quantity to be injected into the prostatic sinus should not exceed six minims. A moment before the application is made the patient should be directed to pass a few ounces of urine, in order that the muco-pus which may have accumulated in the prostatic urethra may be washed away. The immediate effect produced by the caustic injection is an inordinate desire to urinate; this may be troublesome for the first few hours; there may even be some hæmorrhage, but all the unpleasant symptoms pass away on the next day, to give place to a smart purulent discharge, which itself gradually disappears in the course of a few days, as perhaps also all the symptoms of prostatitis. If the first application be not successful, a second, third, or even a fourth may be made, but at intervals of at least three weeks. Generally the first application will answer well if it be carefully made.

* Otis on Chronic Urethral Discharges: New York Medical Journal, June, 1870.

CHAPTER XII.

HYPERTROPHY OF THE PROSTATE.

THIS disease is peculiar to advanced life, and is so slow in its progress that it is called by some authors, "chronic senile hypertrophy." In treating of hypertrophy of the prostate, Sir Benjamin Brodie makes use of the following language:—

"When the hair becomes gray and scanty, when specks of earthy matter begin to be deposited in the tunics of the arteries, and when a white zone is formed at the margin of the cornea—at this period the prostate gland usually, I may say invariably, becomes increased in size. This change in the condition of the prostate takes place slowly, and at first imperceptibly, and the term chronic enlargement is not improperly employed to distinguish it from the inflammatory attacks to which the prostate is liable in earlier life." *

M. Mercier says: "The prostate, like all the other organs, I might even say more than most of the other organs, undergoes with age changes which it would be useful and curious to follow, from early life to extreme old age. . . . As soon as a man has passed fifty, one may be almost certain that his prostate has increased in volume." †

Mr. Adams says: "In advanced age, when all or most other

* Lectures on the Diseases of the Urinary Organs, by Sir Benj. Brodie, Bart., etc., etc., p. 118. 2d edit. Lond., 1835.

† Recherches anatomiques, pathologiques et thérapeutiques sur les maladies des organes urinaires et génitaux, considérés spécialement chez les hommes âgés, par L. Auguste Mercier. Paris, 1841. P. 145.

structures in the body begin to show evidences of want of nutrition, and become atrophied, or waste by interstitial absorption, the prostate gland very frequently undergoes a remarkable increase in size. This change in the gland is so common after the age of fifty, that an enlarged prostate may be almost regarded as one of the necessary contingencies of old age.”*

Dr. Hodgson and many other authors have expressed similar views.

It is true that “chronic senile hypertrophy” of the prostate is by far the most common affection of this organ, but that this disease necessarily occurs in every man after the age of fifty, is clearly not the case; and we have abundance of evidence of this fact from our daily observations, and from the testimony of some of the most competent modern authorities. It may be safely asserted that not more than one out of three men, of upwards of fifty years of age, is affected with hypertrophy of the prostate.

Sir Henry Thompson, who, conjointly with Dr. Messer, has carefully dissected the prostates of about two hundred subjects over fifty-five years old, found that about one in three exhibited some enlargement of the prostate, but that only one of these patients out of seven had had symptoms of the complaint.† According to the same author, “the period of life between fifty-five and sixty-five is that during which the affection most commonly begins to be developed.”‡ He has never met with an instance of hypertrophy of the prostate “at so early a period as fifty years of age,” while on the other hand he says, “it appears rarely to commence after seventy. . . . and is exceptional after eighty or eighty-five.”‡ He is of opinion that a man who escapes

* On the Anatomy and Diseases of the Prostate Gland, by John Adams, F.R.C.S., etc., etc. Lond., 1851. P. 66.

† Clinical Lectures on Diseases of the Urinary Organs. Pp. 56-57.

‡ Diseases of the Prostate, etc. 3d edition. London. P. 139.

enlarged prostate at the age of sixty-five is likely to escape it altogether.

Senile hypertrophy of the prostate consists of an augmentation of the muscular and connective tissues of the organ, with little, if any, increase of the glandular element. There is increase of volume, of weight, and of density, with alteration of form. The enlargement may be general or partial.

The average measurements of the healthy prostate (which is in form like a chestnut) being one inch and a half longitudinally, in a straight line from the base to the apex, one inch and three-quarters transversely, near the base, and seven-eighths of an inch in thickness near the base, and its weight being from four and a half to five drachms, any marked excess in these measurements and weights constitutes hypertrophy,* but the alteration of form is often a much more reliable indication. If a prostate, on careful examination, prove markedly rotund, it may surely be regarded as hypertrophied, especially if, laid open longitudinally through the anterior isthmus,† it be found very firm and dense in structure, and its lobes and median portion encroach upon the urethral canal, or upon the urethro-vesical orifice. The degree of hypertrophy to which this organ is subject is very variable, and ranges from seven drachms to as many ounces, and even more.

One of the eleven specimens preserved in the New York Hospital Museum (No. 818) is described as being about the size of a goose-egg. An enormous prostate (the largest non-malignant

* Sir Henry Thompson considers a weight of seven drachms as indicative of hypertrophy of the prostate, when found in a subject of about sixty years.

† The more modern anatomical designations of the different parts of the prostate are here adopted, because they are the best and most rational. The anterior isthmus or commissure is that portion of the prostate which unites the lateral lobes anteriorly from the apex to the base; the posterior isthmus is that which corresponds to the anterior, with the exception of the thicker portion lying behind the *veru montanum*, which has been called, by Sir Everard Home, the middle lobe, but which is now termed the "median portion."

on record), "nearly the size of a cocoanut," and weighing seventy-five drachms, is described and figured by Sir Henry Thompson.*

The hypertrophied prostate may be uniformly enlarged; one part may be more developed than another: for instance, the lateral portions alone may be enlarged; one lobe may be considerably larger than the other; the anterior and posterior isthmus may be more affected than the other parts, or the median portion may be the prominent feature of the hypertrophy ("centric hypertrophy"). It is natural that portions of the diseased organ should project most where there is the least resistance. The prostatic urethra is often considerably lengthened, pushed to one side, or may be tortuous, and thus render catheterism extremely difficult.

Fibrous Tumors—isolated, easily enucleated, and spheroidal,—are frequently found in the substance of the enlarged prostate; sometimes they lie close to the surface and project sufficiently to give the organ a nodular appearance. They are also frequently developed in the median portion, and often become pedunculated, and close the urethro-vesical orifice, after the manner of a ball valve. These tumors may even be developed far beyond the base of the prostate. I have seen two instances, in each of which a small fibrous tumor had formed in the substance of the muscle of the ureters, exactly in the median line. In one the tumor was as large as a pea, in the other it was double that size.

To Velpeau is due the credit of having pointed out the close analogy existing between fibrous tumors of the prostate and fibrous tumors of the uterus. Their clinical history and their histological constituents seem sufficient to establish the correctness of this view.

The outflow of urine is impeded by the projection within the bladder of one of the lobes,—which may be considerably more

* Op. cit., p. 87, et tab. vii.

enlarged than its fellow,—by several small tumors developed around the vesico-urethral orifice, but more commonly by an outgrowth of the median portion.* Whichever may be the mechanical cause of obstruction, the result is the same, *i. e.*, accumulation of urine, to a greater or less extent. The bladder often becomes filled to overflowing, and by this over-distension the vesico-urethral orifice is sometimes stretched open, and the urine dribbles out involuntarily. This condition is unfortunately too often mistaken for the extremely rare occurrence of true incontinence. Mercier long since proved, beyond any cavil, that involuntary dribbling of urine is due mostly to obstruction at the vesical neck, or in the urethra, and not, as previously supposed, to paralysis of the bladder; and his convincing arguments take up nearly a whole chapter.† He however recognizes the existence of very exceptional cases—which he relates—of general hypertrophy of the prostate, causing real incontinence; the urine escaping from the bladder as fast as it oozes out from the ureters. This, he says, is caused by the lateral development of the median portion, which keeps the vesico-urethral orifice patent, and thus allows the urine to escape constantly.‡

Sir Henry Thompson's axiom, that involuntary flow of urine indicates retention and *not incontinence*, cannot too often be repeated, and should be applied to the great majority of instances where the urine dribbles.

Cases of involuntary dribbling of urine from retention due to enlarged prostate occasionally come to my knowledge, or under my immediate observation, that had been treated for "paralysis of the neck of the bladder," and the patient told that the flow of

* Often the severest symptoms are produced by very little enlargement of the median portion; but in such cases the small outgrowth closes accurately, like a valve, the urethro-vesical orifice.

† Mercier, *op. cit.*, 1841, p. 100 et seq.

‡ Idem, p. 261 et seq.

water was too free and should be repressed; and to "stop this incontinence" all kinds of nauseous draughts are given, but nothing else is done, and no exploration is made. Such patients are sometimes kept two and three days with their bladders greatly distended, and the attendant, incredulous at first, is surprised when he sees a quantity of urine, varying from two to three pints, drawn off by the catheter.

The consequences of unrelieved retention of urine from enlarged prostate are the same as those which arise from retention due to neglected stricture of the urethra, *i. e.*, cystitis, atony, hypertrophy of the muscular coat of the bladder, ulceration of the mucous membrane, dilatation of the ureters and renal pelves, disorganization of the kidneys, and death.

Cystitis.—As in most cases of enlarged prostate, the bladder is incapable of emptying itself completely, some urine stagnates in the dependent bas-fond, becomes ammoniacal, and so acrid from decomposition that it gives rise to inflammation of the vesical mucous membrane, and sooner or later to the formation of stone, which is an additional source of irritation; the calculi not unfrequently become encysted, and it is sometimes impossible to seize them either with the lithotriptor or with the lithotomy forceps.

Atony of the bladder.—When the urine is imprisoned by a valvular outgrowth of the median portion of the prostate, or by hypertrophy of either lateral lobe, the bladder becomes greatly distended, its parietes are attenuated, its muscular fibres are over-stretched, and the consequence is that the organ is no longer able to contract and expel its contents, even if the obstruction should cease to exist; this condition is called atony of the muscular coat of the bladder. After a time there is constant dribbling, but the viscus remains distended, and, even if a catheter be introduced, the urine flows in such a feeble stream that pressure in the hypogastric region is necessary to force it out.

Hypertrophy of the muscular coat of the bladder.—Often the first effects produced by the urethro-vesical barrier are strong efforts on the part of the bladder to expel the accumulating urine, and these continued contractions eventually give rise to hypertrophy of its muscular coat, and its interior becomes columnar, and is similar in appearance to the ventricles of the heart. The mucous membrane is inflamed, coated with pus in patches, is slaty, or may be here and there ulcerated. The ureters become dilated from fluid pressure and their coats thickened; the renal pelves undergo the same changes, and finally the kidneys are disorganized, and cease to perform their functions.

Symptoms of Hypertrophy of the Prostate.—At the beginning of prostatic enlargement there are no appreciable symptoms; there are indeed none, often, until the organ has attained very considerable proportions, or until retention of urine has supervened to indicate the existence of obstruction. When, however, there is hypertrophy of the median portion (“centric hypertrophy”), the symptoms manifest themselves much earlier than otherwise. Perhaps the first inconvenience the patient experiences is a slight increase in the frequency of micturition; he afterwards notices that his stream is not propelled with as much force as before, is more perpendicular and sometimes wets his shoes, and that there is some dribbling after he thinks the act accomplished. Then he begins to suffer pains in the loins, in the course of the sciatic and other nerves of the lower extremities, and, believing himself the subject of rheumatism or of lumbago, submits to all manner of treatment, without, of course, the slightest benefit. In time, annoying dysury and strangury supervene, and he ascribes his troubles to “some obstruction at the neck of the bladder,” and correctly too. As the disease progresses, there is a sense of fulness and aching in the perinæum, rectum, and hypogastrium; greatly increased frequency of urina-

tion, both day and night; the stream is with difficulty started; it is feeble, and suddenly stops, to give place to a succession of fifteen or twenty drops, when, after an effort, again comes the feeble perpendicular stream, which in a few seconds is followed by the dribbling, and in ten or twelve minutes of such torment only an ounce or two of urine may be passed; and yet if at this moment a catheter be passed, from two to twelve or more ounces of alkaline urine may be drawn. This residual urine is prevented from escaping by the urethro-vesical obstruction, and it lies in the deepened bas-fond until removed artificially. During these straining efforts the patient may have an involuntary discharge of fæces, or an inch or two of the rectal mucous membrane may prolapse. After a long continuance of violent straining during micturition a hernial protrusion may take place, or he may become affected with troublesome hemorrhoids. There is pain at the extremity of the penis, similar to that which occurs from the presence of stone in the bladder. Erections of the penis are frequent, as are involuntary nocturnal emissions of semen; and during the day there is often a more or less profuse discharge of muco-purulent matter: all evidences of the existence of chronic prostatitis.

In the more advanced stages of the disease the symptoms above described are all greatly increased in urgency. The bladder being engorged, the urine dribbles incessantly, saturates the garments of the patient, and renders him repulsive to others; his appetite soon leaves him; he loses strength and flesh; his sleep is greatly disturbed; he is frequently attacked with rigors, followed by febrile reactions, and is liable to complete retention of urine on the slightest exposure or imprudence.

Complete retention of urine, as before stated, is sometimes the first symptom experienced by the patient, and may be provoked by any imprudence, but especially by exposure to cold, which gives rise to temporary congestion and swelling of the prostate.

CASE.—A gentleman, aged 66, who, having previously enjoyed excellent health, had no idea that there was anything wrong with his urinary organs, was seized, on a very cool September morning, with the most distressing, constant, and urgent desires to pass water, which came away in a weak stream and in drops every few minutes. He stated that while at his country residence on the previous evening, which was quite cold, he had relieved himself out of doors while a little heated from walking, and that he had felt chilly immediately after. He retired to bed as usual without experiencing any other inconvenience until morning, when, on rising, he attempted to urinate, and found it impossible. He at once came to town and called upon me. After having placed him upon his back, I introduced a gum catheter and drew off a pint of urine; catheterism was afterwards necessary every six hours, as his bladder could not relieve itself. Rectal examination revealed a slight enlargement of the prostate; but it was evident from the urethral exploration, the mode of urination, and the sudden retention, that the obstruction was due to a valvular outgrowth of the median portion ("centric hypertrophy").

In a few months the diagnosis was verified at the necropsy; the outgrowth of the median portion projected two-thirds of an inch in the bladder, and was of nearly the same breadth at its base.

Changes in the urine.—The urine is acrid, causes much scalding pain in the urethra, and is not unfrequently mixed with blood. As some of it is almost always retained, it becomes stale and gives rise to cystitis, and the ammonia resulting from its decomposition gelatinizes the pus so copiously formed, and a large quantity of this altered, viscid pus settles at the bottom of the urinal: this sediment is often called "ropy mucus," and is supposed to be an indication of "chronic vesical catarrh;" but the existence of such a disease as "chronic vesical catarrh" may well be questioned, as the mucous membrane of the bladder, in chronic cystitis, probably secretes less mucus than in health.

Diagnosis.—There are two modes of examining the prostate for purposes of physical diagnosis: 1st, by the rectum; 2d, by the urethra.

Exploration by the rectum.—From the close proximity of the prostate to the lower bowel, its outline may be readily enough mapped out by the finger introduced into the rectum. This is, however, most unpleasant both to the surgeon and to the patient; but many disagreeable things must be lost sight of where good is to be accomplished, and no high-minded man will shrink from performing such a duty, even if it be absolutely revolting to his feelings. But, after all, the offensive part may be reduced to a minimum if proper precautions be taken. Before making the exploration, the rectum should be thoroughly cleansed by an enema, and the surgeon should protect the under part of the extremity of his left index finger-nail with a little ordinary laundry soap, and then anoint the whole finger with cerate, preparatory to introduction. These preliminary remarks may seem unnecessary, but I make them because I know to what extent rectal exploration is neglected, by young practitioners especially, from a sense of false shame.

To shirk any proper or legitimate mode of arriving at the truth because it is unpleasant is a wrong of which no honest physician should be guilty. It is no easy matter, however, to obtain the right information from a digital exploration of the prostate per rectum, unless the operator has gained considerable experience in examining the organ in its healthy state. For that reason I have caused my pupils to explore the healthy as well as the diseased prostate per rectum, and have advised them, in examining for hemorrhoids in middle-aged men, always to seize the opportunity to explore the normal prostate, as constant practice is absolutely necessary to be able to make the distinction between the healthy and the diseased organ.

The patient should be placed upon a firm bed, with his knees drawn up almost in the lithotomy position, and the finger carefully, deliberately, and gently introduced until it reaches the apex

of the prostate; it is then carried onward to the base, to estimate the longitudinal diameter of the organ; generally, if the base cannot be easily reached, it may be concluded that there is enlargement; if, however, the finger can be passed beyond this, it may detect enlargement of the median portion. The right and left lobes should then be explored, and their relative size, their consistency, their form, the character of their surface, whether smooth or nodular, be ascertained.

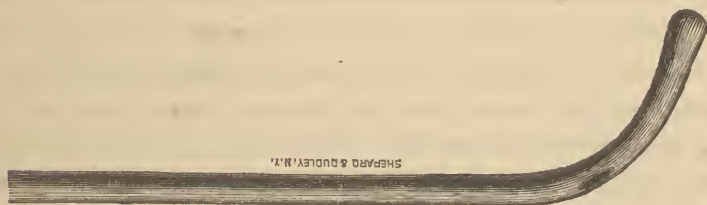


FIG. 56.—Thompson's exploring-sound.

To explore the prostate by the way of the urethra it is necessary to employ a metallic sound or catheter with a short curve. The best instruments for the purpose are Mercier's and Thompson's. Mercier's is a No. 7 or 8 metallic sound, eleven or twelve inches long, with a polygonal plate at the distal extremity for handle. The vesical extremity for about two-thirds of an inch is abruptly curved. This instrument is especially useful to diagnose outgrowths of the median portion, but it also does extremely well in other cases. The mode of using it is as follows: the sound is passed into the urethra until it reaches the prostatic portion; if there be more hypertrophy of one than of the other lobe the beak will be pushed to the opposite side, and the slight movement of rotation thus imparted to the shaft and handle will indicate the affected side. In the case of a median outgrowth the convex portion of the instrument will abut against it, and will have to be lifted up into the bladder either by a finger introduced

into the rectum, or by depressing the handle below the horizontal line, before the obstacle can be surmounted. Once in the bladder, the instrument is to be rotated to the right and to the left, when its curved extremity will come in contact with the outgrowth, and give some idea of its extent. Before the point can be completely reversed, the instrument will have to be pushed an inch or more onward; this done, it may be used to explore the walls of the bladder, and as a searcher for calculi, then withdrawing it a little, its concavity will embrace the outgrowth, and the depth of the *bas-fond* estimated. The same information can be gained by employing Thompson's exploring-sound (Fig. 56), which is hollow and has an eye near the extremity, through which the residual urine can be drawn.

Treatment.—The earliest serious effect of hypertrophy of the prostate being more or less obstruction to micturition, the first indication of treatment should be to facilitate the escape of the urine.

The medical attendant, having directed the patient to urinate in his presence, and to attempt to empty his bladder, passes a gum-catheter of appropriate curve, and draws off the residual urine, or a part of it—for it may not exceed two ounces, or may fill a pint measure, in which latter case it is best to remove only about one-half every day for at least two weeks, and then a little more each time until the bladder can be safely emptied.* The next step is to prevent the accumulation of urine in the pouch-like *bas-fond*, by introducing the catheter once, twice, or three times, as the case may require, in the twenty-four hours. It is of

* The most serious, even fatal, consequences have been known to ensue from emptying at once a bladder which has for weeks contained a pint or more of residual urine. I might cite several illustrative cases which have come under my own observation, but the fact (first noted by Sir Benj. Brodie) is already too well established to require additional proof or comment.

great moment that the bladder should be completely emptied once or twice a day, as the residual urine soon becomes ammoniacal, and is certain to give rise to cystitis, and, perhaps, to the formation of stone. When frequent catheterism is imperative, as in a case where the obstruction is such that no urine at all can escape, the patient should be taught to relieve himself; and this will not generally be very difficult. The great majority of persons of ordinary intelligence can soon be made to understand the importance of ridding themselves of an irritant which has already caused them so much inconvenience and pain, and will even become very adroit in the use of the catheter.

The best and safest instruments that can be placed in the hands of a patient with enlarged prostate, obliged to draw his



FIG. 57.—Overcurved gum-instrument for catheterism in cases of centric hypertrophy of the prostate.

urine very frequently, are : first, *the English gum-catheter*, which has been mounted on an overcurved stylet for a month or two—but the stylet should be removed before the instrument is passed—or he may be instructed to dip the vesical end of the catheter a moment before using it into hot water, to overcurve it, then suddenly to chill it in cold water, and to introduce it without delay, as by the heat of the urethra its curvature will be somewhat changed, and in a little time even lost. The incurvation

must be adapted to the peculiarities of each individual case. It should be very abrupt when the obstruction depends mainly upon a median outgrowth.* The distal half of the catheter may be reinforced by a stylet of half the ordinary length, and the patient directed to stand in front of a chair or stool upon which he has placed a proper receptacle for the urine, to seize his penis laterally behind the corona glandis with the left thumb and index finger, palm up, and having oiled the catheter—No. 6 or 7, rarely larger—to hold it with the right hand so that the shaft will lie close to the line of Poupart's ligament. Then to pass it deliberately—changing its direction as in ordinary catheterism, and holding the penis a little upon the stretch close to the abdomen; but without loss of time until it has reached the depth of eight inches and a half, or thereabouts, from the eye, as indicated by a white mark upon the shaft. The catheter and penis are then to be depressed *together*, while the instrument is gently pushed onward, and the removal of the stylet will allow urine to flow. As soon as the bladder is emptied the catheter should be slowly and cautiously withdrawn.

The next best instrument, which is even better than the firm English catheter in cases of hypertrophy of either lateral lobe, as it adapts itself more readily to lateral deviations, is the French one-eyed soft olivary gum catheter. (Fig. 58.)

Third in rank is the soft vulcanized tan-colored rubber catheter, reinforced by a stylet at its distal half, which will sometimes

* This latter mode of curving gum-catheters was kindly taught me some years ago by a gentleman who has been under the care of Sir Henry Thompson, and who has acquired from that master a high degree of skill in catheterism. This patient, who is suffering from centric hypertrophy of the prostate, has not passed urine spontaneously for seven years, and uses the catheter from four to six times in the twenty-four hours. With the exception (in seven years) of an attack of orchitis, and occasional seizures of urethral fever, he has been and is now in a very fair physical condition, and is able to take daily out-door exercise.

insinuate itself where all others fail, especially in lateral deviation together with a deep prostatic sinus and a median valvular outgrowth. The patient should be cautioned against using catheters which are at all worn, or cracked, or whose eyes are deformed by use, as the slightest inequality in the instrument causes pain and irritation, and even erosion of the urethral mucous membrane. Orchitis, which is by no means an infrequent consequence of often repeated catheterism, is also traceable to the use of defective or worn-out catheters.



FIG. 58. French olivary gum catheter.

Chronic cystitis.—The next indication is to combat cystitis. This almost invariable consequence of enlarged prostate is usually mitigated by the daily removal of the residual urine; but when it has lasted a certain time, and there is inordinate irritability of the bladder, the most constant and judicious attention is required to keep it at bay.

The Treatment of Chronic Cystitis from urethral obstruction should be twofold—general and topical. The failing health of the patient requires especial care. He should be placed under the most favorable hygienic influences. Proper food, suitable clothing, bathing, tonic medicines, and such other devices as will naturally suggest themselves to the man of good judgment, should be brought to bear in meeting the exigencies of the case. Then medicinal agents which modify the urinary secretion should be administered. The virtues of plants, balsams, and other medicaments, too numerous to mention, have been extolled by as many therapists, in the treatment of cystitis; but while it is recognized that some of them possess certain excellent qualities, it should be remembered that they are only accessories. Among

those that I have used, perhaps the best is the *triticum repens*. This should be given in the form of a decoction of one and a half ounces of the dried and cut underground stem to a quart of water, to be allowed to stand one hour and then boiled half an hour, strained, and taken cold, in doses of a gill four times a day. Of the balsams, the *copaiba* is the most efficient. The citrate of potash is also an excellent adjuvant, and may be given in twenty-grain doses in sweetened water, flavored with essence of lemon. In extreme irritability of the bladder, opium may be freely given by mouth or by the rectum, combined with *belladonna*, in the form of suppositories.

Before dismissing the subject of constitutional treatment of chronic cystitis, I shall say a word about the muriate of ammonia, which is worthy of more extensive use, in view of its recognized good effects in affections of the mucous membranes, and in glandular and uterine enlargements. Owing to the analogy existing between the latter affection and prostatic hypertrophy, this compound has been recommended and employed to combat the last-named disease. But it has not been tried on a sufficiently large scale, in senile hypertrophy of the prostate, to enable us to form a just estimate of its value. I have for the last fifteen years given this salt in bronchial affections with the most gratifying results; but it is only lately that I have prescribed it in urinary diseases and have found it of the greatest service in chronic cystitis.

The muriate of ammonia may be given in ten-grain doses in an ounce of mint water three times a day, and gradually increased to thirty grains three times a day, if well borne by the stomach. It should be given for a couple of months if it agrees well with the patient; but every ten days it should be suspended for twenty-four or forty-eight hours. As this drug is apt to produce constipation, it is well to administer occasional aperients or even cathartics.

The topical medication should consist of fomentations and mild counter-irritants to the hypogastric and perineal regions, of rectal injections of tepid water, of rectal suppositories, and of vesical injections.

The best means of injecting the bladder—recommended by Sir Henry Thompson—consists in introducing a No. 7 or 8 gum catheter, and filling a six-ounce India-rubber bag (Fig. 59) with warm water (100° F.), and making four or five successive injec-

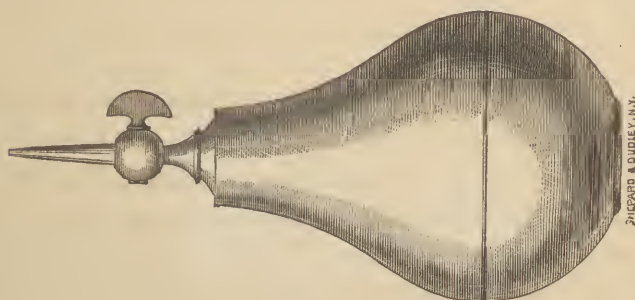


FIG. 59. India-rubber bag for injecting the bladder.

tions of not more than an ounce each. This should be done with care and deliberation, should not give pain, and should not be repeated oftener than once a day. The water may be slightly acidulated with nitric acid in case the urine is highly and persistently alkaline. Another excellent agent is a solution of five grains of borax to the ounce of water. In the event of phosphatic concretions, the acetate of lead solution is invaluable, and can be used, according to the case, from one-quarter of a grain to four or five grains to the ounce of warm water. I once used it, for the purpose of decomposing an encysted calculus, at the rate of seven and a half grains to the ounce, and injected four ounces of the solution.

Atony of the bladder also requires general and topical medication, the former consisting of ferruginous preparations, prin-

eipally the tincture of the chloride of iron in combination with wine of ergot, strychnia (one-twentieth of a grain), with two grains of quinine, three times a day, a generous diet, etc. The latter should comprise cold douches to the perineal and hypogastric regions, evacuative catheterism at least three times in the twenty-four hours, and vesical injections of tepid water to be gradually decreased in temperature to 50° F.; and lastly, electricity—the Faradic current—the negative pole to be applied to the hypogastric region, the positive to the perineal and sacral regions alternately; or, the negative pole insulated by a gum catheter may be introduced within the bladder, and a milder current used.

In this connection I must say that I think the day will soon come when we shall be able to bring to bear electricity—this powerful modifier of nutrition—in the treatment of enlarged prostate with better results than have thus far been obtained.

Management of retention of urine from hypertrophied prostate.—Complete retention of urine is often the first warning of the existence of enlarged prostate; but it is an evil which cannot always be prevented, in cases where the disease is already known to exist. It is induced by congestive swelling at the base of the prostate, sufficient to completely close the urethro-vesical orifice.

It is not always wise to proceed at once to catheterism in an old man, broken down by age and disease, who is attacked with retention. He should first be well covered in bed. The temperature of his room should be kept equable, and not lower than 70° F. His bowels should be emptied by an enema. A free opiate should be given by mouth, and a suppository of two grains of opium and half a grain of extract of belladonna introduced into his rectum. For beverage he should have a diluent of citrate of potash, or twenty grains of the bicarbonate of potash in half a glass of water. When, however, in two or three hours he has

become somewhat composed and refreshed, perhaps by sleep, and the irritability of his bladder has lessened, a small gum catheter (No. 6), suitably curved, may be introduced, and half or two-thirds of the contained urine drawn off. Every two or three hours, after this, the catheter should be passed, and some urine withdrawn until the bladder is completely emptied. When catheterism is extremely difficult, and hæmorrhage occurs, it is advisable to secure the instrument in position, and not to withdraw it for two or three days, in the hope that the congestive swelling may subside, and that the future attempts at catheterism may be successful.

But if catheterism with the simple gum instrument fails, one of the best methods to be next tried is Mr. Hey's, in which a metallic stylet, curved to suit the case, is inserted into the gum catheter; the instrument is introduced down to the prostatic sinus, the stylet slowly withdrawn an inch, and at the same time the catheter is seized with the left thumb and index, and pushed gently onward. The increased curve thus obtained allows the point of the instrument to surmount the obstacle and to enter the bladder. This method has sometimes been successful in my hands when all others have failed.

In one of my cases only the French olivary catheter could be introduced; this was owing to a very tortuous prostatic sinus to which the soft vesical end of the instrument adapted itself admirably. In another neither the French nor the ordinary English gum catheter would pass, but a capillary whalebone bougie entered the bladder, and over this a tunnelled gum catheter was successfully introduced.

As a rule, I would not recommend the use of metallic prostatic catheters, but there are exceptional instances in which it is necessary to employ them.

In some instances where it is impossible to pass either the

gum or the metallic catheter, Sir Henry Thompson advises a combination of the two; the former to be invaginated into the latter, which is opened at both extremities.* Mercier's *sondes coudées* and *bi-coudées* are often instruments of great utility.† His invaginated catheter for avoiding false passages is also of much value.‡ Another device proposed within two or three years for the relief of retention of urine, due to enlarged prostate, is the vertebrated catheter of Drs. Squire, Sayre, and Caro (Fig. 60).

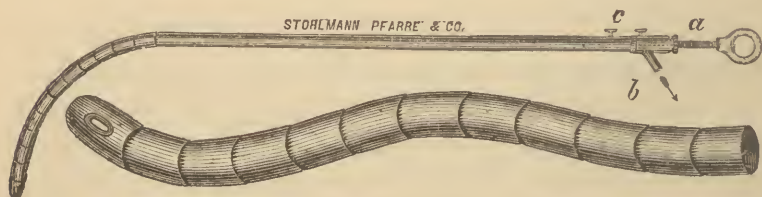


FIG. 60. The vertebrated catheter; Dr. Caro's model.

Never having used the instrument, I can speak neither for nor against it. It is, however, reported to have been very useful in some cases where ordinary catheterism had failed.

Puncture of the bladder with capillary trocars.—When catheterism is impracticable, the usual resort is puncture of the bladder above the pubes with a slightly curved trocar of ordinary size—an operation which has been superseded by the supra-pubic puncture with capillary or very small trocars, and the urine drawn off by an aspirator. There is no lack of cases, both at home and abroad, to show the superiority of this procedure over the ordi-

* Diseases of the Prostate. Third Edit. Lond. P. 237.

† Mercier—Recherches sur le traitement des malades des organes urinaires, considérées spécialement chez les hommes âgés. Paris, 1856. P. 152–158.

‡ *Idem*, p. 162.

nary methods of puncture. In the Medical Record of June 1, 1872, page 220, is an account by Doctor Clarke of Geneva, N. Y., of an interesting case, illustrating the innocuity of supra-pubic puncture of the bladder with an exploring trocar. The case occurred in the practice of Dr. G. N. Dox, of Geneva, N. Y. The puncture was repeated six times in the course of eight days, and was always followed by primary union. Here the urine was drawn off without the aid of the aspirator.

Puncture of the bladder with capillary trocars, combined with pneumatic aspiration, was first suggested by M. Dieulafoy, and put into practice by M. Léon Labbé. M. Potain, of Paris, and Dr. Protheroe Smith, of London, both claim priority in the invention—whether justly or not is of little moment, but M. Dieulafoy certainly deserves the thanks of the profession for having popularized this mode of relief. In our country Dr. Bowditch, of Boston, had, as early as 1852, directed attention to the superiority of capillary puncture with aspiration in the operation of thoracentesis. Professor Thomas, of New York, had many years ago used the capillary trocars, with a syringe to draw fluid from abdominal tumors, for diagnostic purposes.

Capillary puncture with pneumatic aspiration has for several years been frequently used by Dieulafoy, Potain, Labbé, Watelet, and many other Parisian surgeons, in hydrothorax, empyema, hydrocephalus, hydrarthrosis, strangulated hernia, abdominal tumors, and retention of urine from enlarged prostate, and stricture and laceration of the urethra. British surgeons have also found this operation of great value. In New York, it has been resorted to by Drs. Sands, Markoe, Peaslee, Emmet, Weir, Loomis, and others. Dr. James L. Little was, I think, the first in New York to use it for the relief of retention of urine.

Dieulafoy's Aspirator.—The best and most concise description of this miniature rack and pinion air-pump is given by Dr.

Little, and I transcribe it textually from his paper, published in the *New York Medical Journal* for November, 1872:—

“This instrument as made by Messrs. George Tiemann & Co.

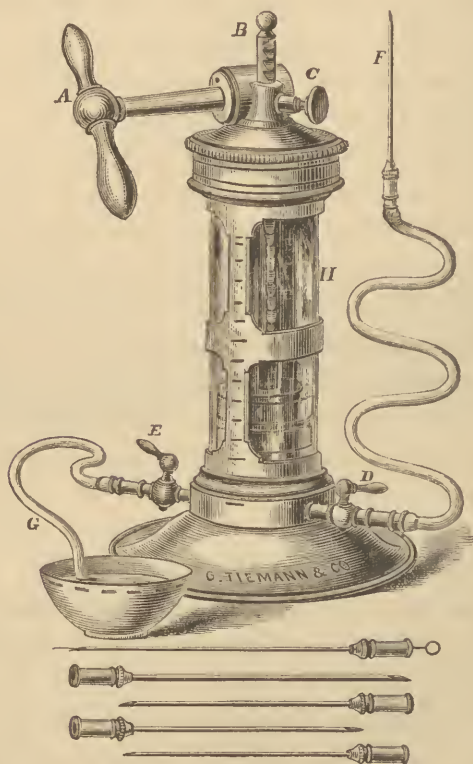


FIG. 61. Dieulafoy's Aspirator.

(Fig. 61), consists of a glass cylinder, *H*, about seven inches in height and two in diameter, with a tight-fitting piston. The cylinder is partly covered with a casing of German silver, nickel-plated. In front is a graduated scale, showing the amount of contained fluid, in grammes,—the gramme in this case being

used as a measure of capacity and not of weight, each gramme being equal to the space occupied by a cubic centimetre of water at a temperature of 39.2° Fahr. The cylinder holds 145 grammes, equal to nearly four fluid ounces.

“The piston, *B*, is raised or lowered by turning the handle, *A*. Near the bottom of the cylinder are two taps, with stopcocks, *D* and *E*. To these are fitted two rubber tubes, as seen in the cut.

“To the extremity of the one connected with *D*, a capillary trocar may be attached. About four inches from this end of the tube is inserted a piece of glass tubing, about three inches in length, so as to allow the fluid to be seen passing to the cylinder. This is not shown in the wood-cut. The contents of the cylinder are discharged through the rubber tube attached to the tap *E*.

“The capillary tubes or trocars, as they are called, represented below the instrument, are six in number, sharp-pointed and of different sizes, the smallest being about the calibre of the tube of the hypodermic syringe, or one-third of a millimetre in diameter and the largest, one millimetre and a half, and all of them four inches in length.”

“In addition to these tubes there should be two or three small, blunt canulas with trocars, and a detachable handle, so that, when the trocar is withdrawn, the canula may be attached to the instrument.

The manner of using the pneumatic aspirator is as follows :

The instrument is first prepared by attaching the rubber tubes to the taps *D* and *E*. After selecting the capillary trocar, it is to be connected to the tube attached to the tap *D*, as represented in the cut. The extremity of the tube *G* should be placed in a basin, to receive the contents of the cylinder.

Closing the stopcocks, *D* and *E*, the piston is raised by turning the handle *A*, and is retained in position by the spring *C*. In this way nearly a perfect vacuum is obtained. The capillary trocar is

then introduced with a rotary motion into the part from which the fluid is to be drawn. The stop-cock, *D*, is then opened, and the fluid rushes into the cylinder, which, when full, is emptied by closing stop-cock *D* and opening *E*, pulling out spring *C*, and lowering the piston. When this is done, both stop-cocks are again closed, and another aspiration made in the same manner."

"*The following practical points* should be attended to in using the instrument:—

1. Be sure that your instrument is in perfect order—that the trocars and tubes are pervious, that the stop-cocks and piston work easily and without leakage.
2. Oil the needles or trocars before using.
3. Combine rotation with pressure in introducing the trocar, holding it between the index-finger and thumb, and introduce slowly, so as to injure the tissues as little as possible.
4. Remove the trocar slowly, and keep up the aspiration during its removal. This prevents the escape of any of the fluid which may remain in the trocar. This is always to be borne in mind whenever the peritonæum is perforated.
5. After using, carefully wash out the instrument and tubes, and insert fine wire into the sharp-pointed trocar or canula before putting it away.
6. It is well occasionally to unscrew the top of the cylinder and pour in about half an ounce of sweet oil. This will keep the piston in good order."

This mode of relieving retention of urine has proved very efficient, by giving time for the subsidence of congestive swelling in the prostate and in the vicinity of strictures of the urethra, so that in a few days the canal has become pervious to instruments. The punctures have healed readily in all the reported cases, and perforation of the peritonæum and even of a loop of intestine has not been followed by any untoward result.

Among the cases mentioned by Mr. Labbé is the following, operated upon by him in February, 1870:

“The patient was a man of sixty-five, affected with hypertrophy of the prostate. A false passage had been the consequence of several unavailing attempts at catheterism carried on during about two days. The bladder was much distended, and the general condition of the patient alarming. I determined to perform, in the hypogastric region and at two fingers’ breadth from the pubis, a puncture with Dieulafoy’s No. 2 capillary trocar. I by this means withdrew 500 grammes of urine, and the patient was immediately relieved. When the bladder had returned to its natural size, and the congestion brought on by this distension in the neighboring parts had diminished, I was enabled to introduce a large sound through the urethra. From that time all accidents ceased, and the patient did well. The puncture had not given rise to the slightest accident or occasioned the least pain.”

Mr. Labbé cites a case operated upon by Mr. Guyon, where “the puncture was repeated twenty-five times in twelve days without the slightest accident occurring. The patient eventually died from the effects of dysentery, and on post-mortem examination it was stated that there existed, on the internal surface of the bladder, four little blackish spots, corresponding to the capillary prickings, but without any infiltration or any loosening of the mucous membrane.”

From the observation and analysis of a number of cases Mr. Labbé arrives at the following conclusions:

“1. That capillary hypogastric puncture is a perfectly harmless operation.

“2. That in all cases it must be substituted for ordinary hypogastric puncture.

“3. That in a great number of cases it may, when only once practised, allow the surgeon to penetrate afterwards into the bladder through the natural passages.

"4. That in certain cases where catheterism is impossible, it may be performed three or four times a day without any injurious effect, and thus permit the surgeon to gain time and restore the natural passages; and at the very least it constitutes a palliative means of the highest importance."*

The Perineal Operation.—Instead of resorting to ordinary vesical puncture after violent and unsuccessful catheterism, and after ample time is allowed for the subsidence of swelling, by drawing off the urine through capillary trocars, catheterism being still impracticable—I would propose the revival of the ancient perineal operation with the modifications described below. Sir Henry Thompson, in speaking of the old operation, says: "This proceeding . . . appears to me calculated to be successful in those cases in which the urethra has not received any serious injury from violent catheterism. It sometimes happens, however, that from this cause false passages have been made below the prostate, constituting, in fact, the difficulty for the solution of which the question of employing a knife or trocar is entertained. In such circumstances an incision upon a grooved staff might, perhaps, lead only to embarrassment, as the urethra might still not be opened or even found." Another objection he urges against the operation is the fear of a permanent urinary fistula.

I do not think these objections tenable, because I am firmly convinced that with care, patience, and skill, the urethra can be found without much delay in the majority of instances. Then again, experience has taught us that any violence done to the urethra, at or near the prostatic portion, in old men, is more liable to give rise to abscess, in or near the prostate, and that pyæmia

* On puncture of the bladder performed in the hypogastric region by means of the capillary trocar and pneumatic aspiration, by Léon Labbé, surgeon to the Hôpital la Pitié of Paris, Vice-Professor of the Paris School of Medicine, etc.—*Practitioner*, October, 1872, pp. 226—233.

often supervenes in consequence. If, therefore, free egress is early given to the pus and urine through a wound in the perinæum, the danger must be very materially lessened. As for the liability to the occurrence of permanent fistula, I am sure that such an event would be preferable to the fatal termination which is looked for in most cases treated in the usual way.

In retention of urine from enlarged prostate, where violent catheterism, producing false routes, has been resorted to, the manner of proceeding should be as follows: The patient, being etherized, is placed in the lithotomy position. A staff with a broad groove extending to its extremity, is introduced into the urethra as far as possible. A free incision is made in the median line of the perinæum to within half an inch of the edge of the anus, involving the skin and superficial layers, then the urethra is opened longitudinally at or near the bulbo-membranous junction, and the wound extended to the apex of the prostate. Such false routes as may be found are freely laid open. A grooved director is introduced cautiously, following the upper wall of the canal when it has reached the bladder, a catheter is passed along its groove into the bladder, and the urine drawn off.

Ablation of Median prostatic outgrowths.—The surgeon should then endeavor to give permanent relief by a procedure which will probably not add greatly to the dangers of the preceding steps. He should first explore the prostate through

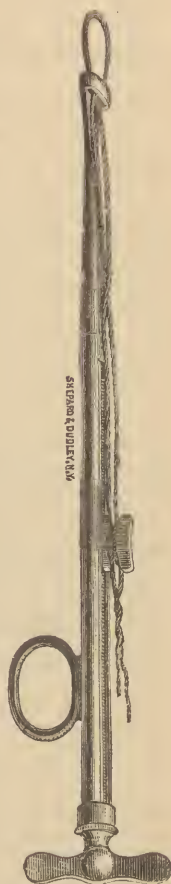


FIG. 62.—The author's *écraseur* for the ablation of median prostatic valvular outgrowths.

the artificial opening, and if he discover a median outgrowth or isolated tumors, he should dilate the prostatic sinus, or incise the prostate laterally, and enucleate the tumors, or if there be a median outgrowth excise it;* but the better plan is to remove it by means of the small wire *écraseur* (Fig. 62), and then to introduce a large-sized soft vulcanized India rubber catheter and retain it in position for two or three days.

Sir William Ferguson has reported a typical case wherein he enucleated a fibrous tumor of the prostate during lithotomy, the patient, nearly eighty years old, making a good recovery.† He also stated that he had, on several occasions, resorted to this expedient, and strongly advised its general adoption.

* Median prostatic outgrowths have been depressed, crushed, incised, and excised with instruments introduced per urethram, by Leroy, Amussat, Civiale, Mercier, and others. These internal operations seem to me more unsafe than excision or enucleation by an external perineal opening. Mercier, however, reports many successful cases treated by internal incision and excision. See *Recherches Anatomiques, Pathologiques et Therapeutiques sur les valvules du col de la vessie*,—par Auguste Mercier. 2d edition. Paris, 1848.

† Observations on lithotomy, and on certain cases of enlarged prostate. By Sir William Ferguson. *Lancet*, January 1, 1870.

CHAPTER XIII.

STONE IN THE BLADDER.

THE symptoms and diagnosis of vesical calculi will not be fully discussed, since they are described in nearly all the text-books and works on general surgery accessible to the student. A few words will, however, be said in regard to sounding for stone—without which its presence cannot be demonstrated—and then the more modern methods of treatment will be detailed.

The symptoms and constitutional effects of stone in the bladder are briefly as follows: Pain in walking or jolting; increased frequency and pain in micturition, the pain more intense during the escape of the last drops of urine; sudden interruption in the urinary stream; pain and intolerable itching at the extremity of the prepuce and glans penis; pricking sensation at meatus urinarius; elongation of the prepuce and penis from constant pulling; frequent priapism; purulent and sometimes bloody, also occasionally alkaline urine; incontinence of urine; prolapse of the rectum; neuralgia of the sciatic and other nerves of the lower extremities, and sundry obscure reflex nervous phenomena.

The pathological effects are, inflammation, more or less intense, of the mucous membrane, then ulceration, which may extend through all the coats of the bladder, and give rise to fistula; chronic prostatitis, especially when a portion of the calculus projects into the urethra. The vesical irritation and tenesmus are often so great as to give rise, in time, to concentric hypertrophy with diminished capacity, and a columnar condition of the interior. Some calculi lodge at the neck of the bladder so constantly

that the urine is retained, dammed up in the ureters, and causes inflammation and great distension of these tubes, and also hydro and pyo-nephrosis. Such cases are usually hopeless, and any operative interference will only hasten the fatal issue.

Before arriving at the final decision respecting the choice of operation, it is of the utmost importance to learn whether the stone is loose or encysted, to form an idea of its size, consistence, situation, and chemical character, and to take into account the condition of the urethra, prostate, and bladder.

Treatment preparatory to sounding.—A patient suspected of having stone should be subjected to a course of treatment preparatory to sounding. This should never be omitted, as very grave consequences often ensue from the too precipitate use of instruments, especially in persons who have not quite recovered from the fatigue and depression incident to a long journey. It is safer to adhere to the rule of preparing all sufferers from stone in the bladder for several days, and in some exceptional cases for one, two and even three weeks, before attempting to introduce an instrument. The patient should be allowed a few days' rest in the horizontal posture, with a pillow under his hips, in order that the stone may roll back to the less sensitive part of the bladder. If he has acquired the habit of using opiates to relieve pain, the dose should be gradually diminished, until he is able to abstain from the drug. Diluents, quinine, iron, and a nutritious diet will together make an excellent substitute for the narcotics, and do more than anything else to tranquillize his nervous system and improve his general health. His bowels should be properly regulated. He should be directed to urinate only while lying down, that the calculus may not be forced against the vesical neck. This may be difficult at first, but in a few days he will experience no trouble in emptying his bladder by turning on either side, or even when upon his back. He should not be per-

mitted to get up until this is accomplished, and the urine can be retained for an hour and a half or two hours.

The first exploration should be made with soft bulbous bougies, to estimate the calibre of the urethra and ascertain its degree of sensitiveness. If the meatus urinarius be too narrow to admit a good sized instrument, it should be freely incised and treated as indicated in Chapter VI.

The second exploration should be made in not less than two days with a searcher of abrupt incurvation and short beak, and not with instruments of ordinary curve, such as that represented by Fig. 14, page 26. The best of all exploring sounds is, I think, Thompson's (Fig. 63), which is hollow, with an eye, one inch from the bulbous vesical extremity, on the convex side, a short beak, a slender (No. 6) shaft ten inches long, and a fluted cylindrical handle, that enables the operator to turn the point to either side, and to reverse it with greater facility and more delicacy than the flat-handled instruments. Another advantage this searcher possesses over ordinary sounds is, that when once introduced, it is not necessary to remove it and pass a catheter to draw off urine from the bladder, or inject warm water when it is necessary to increase the quantity of fluid; all this can be accomplished by simply withdrawing the plug from the distal extremity of the sound which is at once converted into a catheter. The mode of passing the exploring sound differs but little from that of introducing the lithotripter, and it should be moved, in the bladder, to find the stone, to and

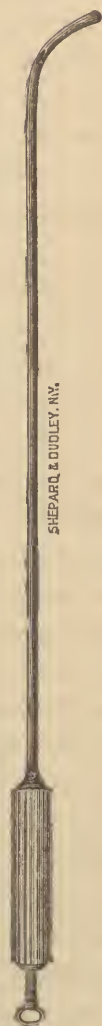


FIG. 63. Sir Henry Thompson's Exploring Sound.

fro, to the right, to the left, and then reversed,—a mark on the handle indicating the position of the point. The contact of the instrument with a calculus not only demonstrates its presence, but that it is smooth or rough, and by the resulting click indicates that the concretion is soft or hard—the soft stone emitting a dull or flat sound, the hard stone, a clear and high-pitched ring; all of which assist in forming some notion as to the probable chemical elements of the calculus. The entrance of the searcher into the bladder also gives an idea of the probable volume of the concretion. Large stones usually lie close to the vesical neck, and are very readily felt, while medium and small-sized calculi are more apt to be found in the posterior part of the *bas-fond*, on either side of the median line. Small calculi sometimes lodge in the urethro-vesical orifice, and are felt before the instrument has entered the bladder. If permitted to linger in that situation they may obstruct the flow of urine, or being gradually forced into the prostatic sinus, cause orchitis, give rise to ulceration and consequent obliteration of the ejaculatory ducts, resulting in emasculation. In three out of four patients that I have treated (lithotripsy) for small calculi, the foreign body was impacted in the vesical neck, and, in each instance, could not be pushed back into the bladder until the patient was placed in the recumbent posture, with the pelvis elevated. If there be two or more stones, they can sometimes be felt by inclining the beak of the sound to one and then to the other side of the median line. When the bladder contains too much urine, a small stone will often temporarily escape detection. If the urine be allowed to flow slowly through the catheter, until the viscus is nearly empty, the foreign body will at last come within reach and be discovered. In old men with enlarged prostate, it is often very difficult to detect the stone, even when the beak of the instrument is reversed. In this case, the left index can be intro-

duced into the rectum, and the calculus thus lifted and brought in contact with the sound; if this fails, the patient may be turned on either side, and even placed, for examination, upon his hands and knees. The stone sometimes lies behind the pubes and is there fixed; to feel it the handle of the sound should be depressed between the thighs, when the beak will be tilted forward; if it cannot be moved from this position, the bladder may be slowly distended with warm water, and the stone, if not encysted or very firmly grasped, will fall to the *bas-fond*.

When the sound strikes a rounded prominence without emitting the characteristic click, it may be inferred that the stone is encysted; sometimes the point of the instrument may touch a small portion of the stone through the mouth of the cyst, and thus leave no doubt of the correctness of the diagnosis.

The sound can be used at the same time to examine the walls of the bladder, and discern the columnar condition, if it exists, and ascertain the capacity of the viscus. The time consumed in sounding ought rarely to exceed five minutes.

Should there be troublesome cystitis, daily injections of warm water and the other means indicated in the management of this complaint may be resorted to. Then, every second day, steel sounds of increasing calibre must be introduced to make dilatation, and blunt the sensibility of the urethra.

The third exploration may be made within a few days, or as many weeks, after the second, according to the condition of the patient. The best instrument for the purpose is a light lithotripter, by means of which the diameters of the stone as well as its consistency can be better known. The lithotripter, with the calculus in its grasp, can be rotated to the right and left, and moved a little to and fro, to search for other stones.

It is almost needless to say that these various explorations should be conducted with the greatest caution and gentleness, as

serious consequences and even death will sometimes follow rough sounding.

Besides the facts learned by physical exploration, the history of the case taken into account will often show whether the disease is diathetic, or has taken its origin in a foreign body as nucleus. The age and habits of the patient often assist in forming a conclusion as to the origin of the calculus. Enlarged prostate obstructing the urethro-vesical orifice causes a certain amount of urine to stagnate in the *bas-fond*, and this then becomes the principal factor in the production of stone.

The urine should be examined chemically and microscopically, as by such examinations the condition of the bladder and kidneys, and also the composition at least of the superficial layers of the stone may be determined.

The modern operations for the removal of stone from the male bladder are, *lithotripsy*, *lithotomy*, and *perineal lithotrity*. Each has its particular adaptation, and should not be employed without proper discrimination. The important point is to decide, in each case, which of the three methods is indicated.

Lithotripsy, the reduction of the stone to powder or to a coarsely granular state, without resort to the knife, is indicated in cases where the stone is free and of medium or small size,—under favorable circumstances stones of large size may be crushed,—where the general condition of the patient is good, his bladder tolerates instruments and his urethra is capacious, or can be rendered so without risk to his life. It is applied to children affected with calculi, that can be destroyed at one or two sittings. In the case of old men with enlarged prostate the operation has been eminently successful, since the introduction of Clover's apparatus for the removal of detritus. I have on many occasions, within a few years, witnessed the performance of lithotomy for soft calculi, not exceeding half an inch in diameter, where the

other indications for lithotripsy were clear, and a successful result might have been anticipated from a single crushing. I am happy to say, however, that these practices receive the severest censure of the majority of our surgeons.

The imaginary hiding-place in the bladder of the last fragment, is the bugbear which deters many from attempting lithotripsy, and which is urged against this operation by its opponents. Those who are at all experienced give themselves no trouble about the last fragment, which, if too small to be felt, will surely escape with the urine. The assertion that, by lithotomy, the stone is always entirely removed is not true. There are many instances where fragments and even entire stones are left in the bladder, after very carefully performed lithotomy.

Lithotomy is clearly indicated in cases wherein the bladder is extremely irritable. Whenever, in such cases, the stone exceeds three-fourths of an inch in its mean diameter, it should not be removed entire but broken up with strong forceps, and the fragments at once extracted.

Perineal Lithotripsy,—the combination of an external urethrotomy, in the membranous region, and dilatation of the prostate and neck of the bladder, with fragmentation of the stone and the immediate removal of the débris,—was, in 1862, proposed and performed by Dolbeau, as an additional resource of surgery, to rid patients of the stone with a minimum amount of cutting. It is, I think, a great improvement over median lithotomy, and is applicable to the destruction of large stones.

LITHOTRIPSY.

For the removal of stone from the bladder, cutting operations had been almost exclusively resorted to until 1824, when Civiale demonstrated, by several successful operations, that vesical calculi could be reduced to powder or broken up into fragments small

enough to be expelled with the urine ; all this was accomplished without a stroke of the knife. At the time M. Civiale made his discovery he was not cognizant of the efforts—in the same direction—of the Bavarian surgeon Gruithuisen, nor was the latter aware that the ancients had sometimes resorted to successive perforations and to crushing for the destruction of stone in the bladder.

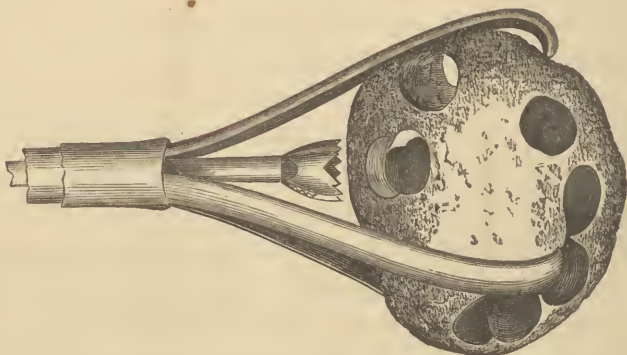


FIG. 64. The vesical extremity of the trilobe and perforator, such as Civiale used in his early operations, showing a perforated calculus within the grasp of the instrument.

The method by successive perforations with straight instruments (Fig. 64) continued to be employed on the Continent by Civiale, Leroy d'Etiolles, Heurteloup, and others, until 1831, when Dr. Jacobsen of Copenhagen devised a curved instrument known as the *brise-pierre-articulé* ; but this was not the first curved lithotripter, for Mr. Elderton had produced one as early as 1819, and



FIG. 65. First model of Weiss' lithotripter.

in 1824 Mr. Weiss, surgical cutler of London, constructed a curved stone-breaker (Fig. 65) which was first used by Sir Benjamin Brodie, who afterwards greatly improved it.

After having seen the last-named instrument, Baron Heurteloup conceived the idea of his “*perceuteur courbe à marteau*,” which he described in the “*Mémoires sur la lithotripsie par percussion*,” presented to the French Academy in 1833. He found



FIG. 66. Jacobsen's instrument closed for introduction.



FIG. 67. Jacobsen's instrument opened for seizure of the stone.

the curved percussor of easier introduction, and better adapted to seize and pulverize the calculus, than were the straight instruments; and he called the operation *lithotripsy*, which conveys the

idea of *pulverization*, or of reduction to very small fragments, while *lithotrity* means *perforation* of the stone. Our *modern improved lithotriptors* are all modelled after Heurteloup's curved percussor, but the shape of the blades has been so altered as to guard against injury to the mucous membrane of the bladder ; besides, pressure by means of the screw, and the rack and pinion (Fergusson), has been substituted for percussion. Their superior, and at the same time simple construction renders the operation very much easier, safer, and more rapid than it was formerly.

Lithotrity was successfully performed in New York city in the latter part of 1830, by Dr. Depeyre, who used the trilabe and perforator of Civiale (Fig. 64).* He was followed by Dr. J. Randolph of Philadelphia, who made his first trial in September, 1832, with the trilabe also, completing the operation with Jacobson's brise-pierre-articulé. (Figs. 66 and 67.)

Dr. Randolph has given accounts of nineteen cases of stone in the bladder, with one death ; in nearly all of them he employed the brise-pierre-articulé with great satisfaction and no untoward accidents.†

Dr. Gibson of Philadelphia gave his preference to Heurteloup's instrument.

Among other surgeons who have frequently resorted to the operation in this country, are Drs. N. R. Smith of Baltimore, Pancoast of Philadelphia, Buck, Post, Van Buren, and Wood of New York.

These few facts bearing upon the history and progress of lithotripsy will suffice for our present purpose, and I shall not occupy any more space with historical details which can be learned from

* See *New York Medical Journal*, February, 1831, p. 383.

† *American Journ. Med. Sciences*, Nov. 1834, Nov. 1836, Nov. 1837, and *Medical Examiner*, Vol. I., 1838.

the elaborate treatises of Civiale, Leroy d'Etiolles, Amussat, Heurteloup, Ségalas, Belinaye, Wm. Coulson, and Henry Thompson, but at once proceed to the description of modern lithotripsy, and of the instruments required for its successful execution.

The first thing to be accomplished in lithotripsy is the reduction of the stone to fragments, and the next is the pulverization of these fragments, that the detritus may be expelled without much irritation in the urethral mucous membrane.

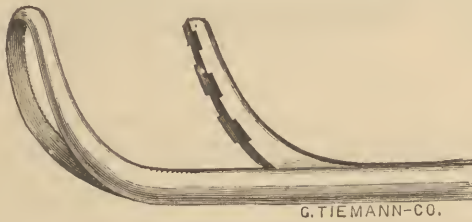


FIG. 68.—Fenestrated instrument.

Modern Instruments.—The modern lithotripter consists of two blades (Fig. 68), the shaft, the sliding-rod, and the handle. The two blades together, when open, are sometimes called the jaws, and when closed, the beak. The blade that is immovable and fixed to the shaft is called the *female*, and receives the *male* blade, which is continuous with the sliding-rod, and is susceptible of a back and forth movement. The average curve of the beak is indicated by Figs. 68 and 69: the less the angle the greater the power, and, vice versâ, the greater the angle the easier the introduction. The beak ranges from No. 10 to 15, for adults. For fragmentation of the stone, the better and safer instrument is the fenestrated lithotripter (Fig. 68), because of its great power and strength. For pulverization, the instrument with plain blades (Fig. 69) should be used; the male is narrower than the female blade, to enable the operator to force out the impacted detritus. But the operation can be completed with the fenestrated litho-

triptor, and it can also be begun and terminated by means of a strong instrument with plain blades. The scoop lithotripter is no longer in use, and has been replaced by the plain-bladed instru-



FIG. 69.—Lithotripter with narrow male blade.

ment. The shaft is at least ten inches in length, and not less than two numbers smaller than the beak. The motive-power resides in the handle of the instrument. The late M. Charrière, of Paris, deserves much credit for having made a very simple but important alteration in the mechanism of the screw lithotripter, by his adaptation of the *écrou-brisé*, which is a nut consisting of two segments that can be approximated or separated instantly by turning the movable disc in the handle; in this manner the screw-power can be applied or detached at will, so that the male blade and sliding-rod can be fixed, or can be withdrawn to the required extent without unscrewing. (Fig. 70.) This is a very valuable



FIG. 70.—Handle of Charrière's instrument.

improvement, inasmuch as economy of time is of the greatest moment in the operation.

The same motive-power is adapted to the English instrument,

with the substitution of a sliding button (Fig. 71) for the disc; it will be observed that here the handle is cylindrical, and much more convenient for manipulation than the French.* Both of the instruments I have are of equal weight ($7\frac{1}{2}$ oz.), although the English looks larger and heavier.



FIG. 71.—Handle of Weiss' improved instrument.

Position of the Patient during the Operation.—The patient should be placed in the horizontal position, upon a firm bed or table; the pelvis should be elevated by means of a hard hair or straw pillow placed beneath; the legs should be flexed upon the thighs, and the thighs upon the trunk; the knees separated, and the heels brought close together. This is called the lithotripsy position. Formerly the bladder was injected with six or eight ounces of warm water, but this is now dispensed with; the urine is simply allowed to accumulate to five or six ounces, and no instrument, save the crusher, is introduced.

Mode of introducing the lithotripter.—If he has been carefully prepared for the operation, no difficulty will be experienced in the introduction of the lithotripter. As the curve of the instrument differs materially from that of an ordinary catheter, the same rule for introduction will not apply to both. To pass the

* Prof. Watson, of Edinburgh, described in the *Edinburgh Medical Journal* (1869), vol. xiv., p. 1069, a very ingenious lever adaptation to the ordinary screw lithotripter, by which, after the first crushing, the fragments can be seized and pulverized or granulated with much greater rapidity than by the usual process. This device is, I think, a very valuable addition to modern lithotripsy, and reflects great credit on its originator, Dr. Watson.

lithotripter into the bladder successfully and without doing damage to the parts, the directions given by all modern lithotriptists should be closely adhered to; they are briefly as follows:—

The operator should stand upon the right of the patient, with his back half turned towards the head of the bed or table, and having warmed and oiled the instrument, seize the penis laterally behind the corona with the left thumb and index, and keep it in the vertical position; then holding the lithotripter horizontally with the right hand, so that its long axis is at a right angle with the patient's body, introduce it gently and slowly, altering the position by a gradual sweep until it is brought to the perpendicular, and has reached the bulbo-membranous junction of the urethra. He should retain it in this position for a moment, when he will feel it sliding into the membranous portion; then depress the handle between the thighs until the instrument has passed the prostatic portion, and it will enter the bladder, and come in contact with the stone by being pushed onward. Should he endeavor to introduce it as he would a catheter, the upper wall of the urethra in front of the triangular ligament would surely be torn across; an accident which might prove very serious. The introduction of the lithotripter is perhaps the most delicate and important step of the operation; unless it is properly performed, the worst results may be expected.

Seizure of the Stone.—The next point is to find the stone and get it between the jaws of the instrument. He should remember that the field of operation is very small, that the instrument must be kept in the median line, and that it should interfere with the coats of the bladder as little as possible, or, to use Thompson's words, "the operator should exert the largest amount of influence on the stone with the smallest amount of disturbance to the bladder." There are two modes employed to seize the stone. In one, Sir Benjamin Brodie's, the blades are

depressed on the bas-fond and posterior wall of the bladder so as to make them the depending portion, where the stone is likely to roll; then the male blade is withdrawn, and in the majority of instances the calculus will fall between the jaws of the instrument. If the stone is not caught, a gentle stroke may be given with the fingers to the handle of the lithotripter, and, as Brodie says, "the slight concussion thus communicated to the bladder will be sufficient to dislodge the calculus and bring it within the grasp of the instrument." Here the object is to bring the stone to the instrument, while in the other (Civiale's method) the instrument is applied to the stone, and as little movement as possible is made. As the lithotripter enters the bladder, the beak is slightly turned to one side, and then to the other, to ascertain the position of the calculus. The moment it is felt, the instrument is turned toward the side opposite the stone and pushed onward into the bladder, the male blade is cautiously withdrawn, then the open instrument is turned over on the side of the stone, is closed, and the foreign body seized. To Sir Henry Thompson, who, after Civiale, has had the largest experience in lithotripsy, and has done so much for its advancement, belongs the credit of having greatly perfected and simplified most of the details of the operation, and I am only repeating what he teaches. He describes five positions to be given to the vesical extremity of the lithotripter in order to find and seize calculi or fragments; they are the "vertical, right and left incline, right and left horizontal," and they enable the surgeon to explore the bladder in the "middle, right, and left."

Fragmentation of the Stone.—The calculus, once caught, is fixed between the jaws of the lithotripter by one or two slow turns of the wheel; then it may be turned more rapidly, until the stone is fractured, when the screw-power is detached, the male blade withdrawn, and fragment after fragment is caught and

crushed, perhaps to the extent of four or five; but the sitting should not exceed five minutes—make it three, if possible.

Mode of pulverizing Fragments.—If the bladder and urethra are in a fair condition, injections and evacuating catheters will seldom be required, as the complete and spontaneous expulsion of the detritus may be confidently expected. In pulverizing fragments, a certain amount of *débris* will almost always be impacted between the blades, and unless the instrument is properly constructed, it will be impossible to get rid of it, and in withdrawing the lithotripter with its jaws only partially closed, the neck of the bladder and urethra may suffer. It is only with the improved lithotripter that the detritus can be properly expelled from the beak; here the male blade is not only narrower than its fellow, but it is slightly bevelled from the centre to the edges on the crushing surface, and acts upon the mud-like detritus after the manner of a wedge, and instead of scattered teeth-like projections to prevent the stone or fragments from slipping away, as in the ordinary instrument, it has oblique serrations, which also serve as gutters for the better expulsion of the soft *débris*. The manipulation necessary to drive away detritus impacted between the blades is described in a few words by Civiale. He says the surgeon grasps the handle of the instrument with the left hand, while with the right he executes upon the wheel slight movements of semi-rotation that approximate and separate alternately the jaws, which act upon the accumulated calculous matter so as to drive it out by the interval between the blades when closed.

Impaction of Fragments in the Urethra.—If calculi could always be immediately reduced to powder, no more instruments would be required than those above described. But it sometimes happens that fragments are impacted in the urethra, and, for their extraction, one of the best instruments is the long slender ure-

thral forceps (Figs. 72 and 73) with double lever, invented by Mathieu, of Paris. This instrument is sufficiently strong to crush fragments of soft consistence. The harder concretions, however, require the urethral lithotripter.

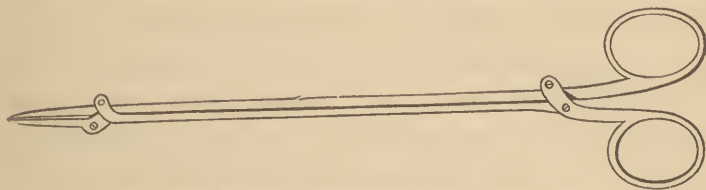


FIG. 72.—Mathieu's urethral forceps closed for introduction.

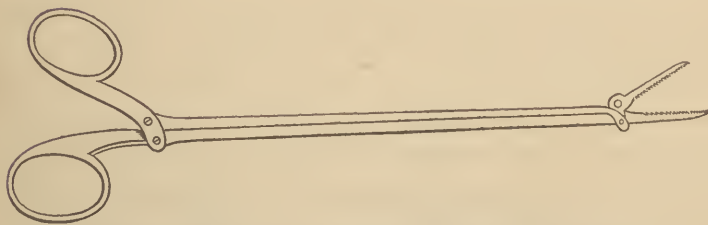


FIG. 73.—Mathieu's urethral forceps open as for seizure of a fragment.

Immediate Removal of Detritus.—In cases complicated with atony of the bladder, and in other instances where it is necessary to remove the detritus at once, Clover's aspirator,—otherwise known as Clover's washing bottle,—or Professor Dittel's apparatus, should be applied to the distal extremity of an evacuating catheter. The latter contrivance consists of a long soft India-rubber siphon, which is attached to the evacuating catheter, and extends to the floor, into a proper reservoir. By means of a valvular arrangement, water may be thrown through the tube into the bladder, and the detritus brought out, by the outward current, with less danger to the mucous membrane than that incurred when Clover's expirator is used.

After-Treatment.—After the first two or three sittings, a hot fomentation is applied to the hypogastrium; the patient is kept in the horizontal posture for twenty-four hours, is directed to micturate only while in that position; and all the urine he passes is strained, and the detritus preserved. For the first twenty-four hours scarcely any fragments will be expelled, and it is all the better, for their angularities are soon smoothed by mutual attrition in the bladder, and those which remain longer become water-worn, and cause little or no irritation in their outward passage. Small calculi are often destroyed at one sitting, but larger ones require five, six, and sometimes many more. If the first sitting has not been followed by any accidents, and the stone is neither too large nor too hard, two or three days may be allowed to elapse before the second sitting, when the lithotripter with a narrow male and flat female blade (Fig. 69) may be used.

Accidents of Lithotripsy.—Besides the occasional impaction of fragments in the urethra, the first crushing, even when performed with the greatest caution, may be followed by urethral fever, hæmorrhage, retention of urine, cystitis, prostatic, and orchitis. Hence the necessity of subjecting the patient to a rigid course of preparatory treatment, upon which the ultimate result of the operation so greatly depends. The modern instruments are so carefully made, that their fracture in the bladder is now a very rare accident.

All but one of my cases terminated favorably, without the least accident. In several instances the stone was destroyed at a single sitting. In one there were two large calculi, and the twenty-seven sittings required to complete the operation were well borne. The detritus collected weighed one ounce and a quarter, and there were no fragments that could not have passed with ease through a urethra of ordinary capacity. The patient gained flesh rapidly, and when last heard from was in excellent health.

Results of Lithotripsy.—The cases of Civiale will not be included in the statistical results herein exhibited, for the reason that his figures have not been accepted in his own country ; but, in justice to the inventor of lithotripsy, it should be stated that his great reputation was well earned, taking into consideration the extraordinary success that he attained with imperfectly-constructed instruments, which he used in half his cases. He made the incautious remark that lithotripsy never caused death. Had he qualified his assertion by adding, properly and opportunely performed, he would have been more nearly correct, and the statement would not have excited severe comments. The cases of Civiale's contemporaries, Leroy and Heurteloup, will also be excluded.

Sir Benjamin Brodie.....	115 cases,	9 deaths,	or 1 in 12.77
Crichton.....	122 “	8 “	“ 1 in 15.25
Sir Wm. Fergusson.....	109 “	12 “	“ 1 in 9.08
Sir Henry Thompson.....	204 “	13 “	“ 1 in 15.69
Dr. Keith (of Aberdeen).....	116 “	7 “	“ 1 in 16.57
Dr. Ivanchich (of Vienna).....	100 “	13 “	“ 1 in 7.69
Dr. Swallin (of Stockholm).....	49 “	7 “	“ 1 in 7
Dr. Porta (of Pavia).....	122 “	24 “	“ 1 in 5.08
Dr. Gurdon Buck (of New York).....	55 “	8 “	“ 1 in 6.87
Aggregate.	992	101	“ “ 1 in 9.82

The worst as well as the best results of lithotripsy are given in the above table, and the average obtained, though it does not represent the results of lithotripsy as now performed in England, France, Germany, and the United States, is such as to disarm the opponents of the operation, who must acknowledge, at least, that lithotripsy, in skilful hands, is less dangerous than lithotomy. But there should be no comparison instituted between these two operations, for those who are familiar with both know well that

where the one is indicated, the other is surely contra-indicated. Though they are usually distinct and independent of each other, their combination has often been found necessary, and has given birth to a new and excellent operation, for which the profession is indebted to Professor Dolbeau, of Paris.

CHAPTER XIV.

LITHOTOMY.

LITHOTOMY was performed in the remotest times of which we have any knowledge. Hippocrates mentions it only to condemn it, and ask his disciples to make oath never to undertake it, but leave the same in the hands of experts ; so great was his dread of wounds of the bladder, which he considered as inevitably fatal. What was the exact manner of operating in those times, we have no means of knowing ; for the first account of methodical lithotomy was given about four hundred years after Hippocrates, by Celsus, and the mode he describes bears his name, and is also spoken of as cutting upon the gripe, or as the lesser apparatus.

The Celsian operation consisted in passing two fingers of the left hand into the rectum, making pressure in the hypogastric region with the right, and pushing the stone to or into the neck of the bladder, and holding or “gripping” it in that position with the fingers. A crescentic incision, with the horns looking towards the ischia, was made through the skin close to the anus, the neck of the bladder then cut transversely, and the stone extracted with a blunt hook. This seems to be the only method used until the beginning of the sixteenth century, when the “greater apparatus” was introduced by Giovanni di Romani, and described and popularized by his pupil, Mariano Santo.

The Apparatus Major.—Here a grooved sound was first introduced, and instead of a crescentic external incision, the cut was straight, parallel to, and near the median raphé ; the bulb of the urethra was cut open, and the vesical neck lacerated by intro-

ducing successively larger blunt gorgets,—which were supposed only to dilate,—until the passage was sufficiently free to permit the extraction of the stone. This method of operating, dangerous as it was, continued in vogue for nearly two hundred years. It was called the greater apparatus, on account of the large number of instruments used during the operation, and is spoken of in our day as the “Marian operation.”

Lithotomy was rescued from the hands of itinerant charlatans by Germain Colot, a French surgeon of eminence, who performed the operation upon a criminal, in presence of Louis XI., toward the end of the fifteenth century.

Without entering for the present into further details of the history of lithotomy, some of the various methods proposed will be enumerated, and only the first three, which are thought preferable in the great majority of cases, will be described; they are the *Lateral*, *Median*, *Medio-lateral*, *Medio-bilateral*, *Pre-rectal*, *Rectal*, and *Supra-pubic*.

THE LATERAL OPERATION.

This operation is traced back to Franco, who describes it in his book on Hernia, Stone, etc., etc., 1561. The notorious Frère Jacques—who, however, at first cut at random through the perinæum into the bladder, without staff—made an oblique incision into the perinæum, opened the urethra upon a staff, and extended this cut to and through the neck of the bladder, and used forceps to extract the stone. In 1702 he published an account of thirty-eight cases successfully treated.

The operation was modified and improved by Ledran, Rau, and Cheselden. The latter, not satisfied with the high operation, and disappointed with Frère Jacques' and Rau's methods, resorted to a mode of operating which he named the “lateral way,” since

greatly improved, and known at the present day as the lateral operation.

Cheselden's Operation.—The following is Mr. Cheselden's own description of the operation.*

“Upon these disappointments, I contrived the manner of cutting which is now called the lateral way. This operation I do in the following manner: I tie the patient as for the greater apparatus, but lay him upon a blanket several doubles upon an horizontal table, three feet high, with his head only raised. I first make as long an incision as I can, beginning near the place where the old operation ends, and cutting down between the musculus accelerator urinæ and erector penis, and by the side of the intestinum rectum. I then feel for the staff, holding down the gut all the while with one or two fingers of my left hand, and cut upon it in that part of the urethra which lies beyond the corpora cavernosa urethræ, and in the prostate gland, cutting from below upwards, to avoid wounding the gut; and then passing the gorget very carefully in the groove of the staff into the bladder, bear the point of the gorget hard against the staff, observing all the while that they do not separate and let the gorget slip to the outside of the bladder; then I pass the forceps into the right side of the bladder, the wound being on the left side of the perinæum.” . . . He gives directions for seizing and extracting the stone, and cautions the surgeon not to break it, and should the wound be insufficient, he advises that it be enlarged. Though at first he used an injection to distend the bladder, preparatory to cutting, he afterwards preferred it to be empty.

The lateral operation of lithotomy is justly regarded as the most brilliant in surgery; requiring much knowledge of the

* The Anatomy of the Human Body. By W. Cheselden. 12th edition, 1784, with a short historical account of cutting for the stone. P. 325 et seq.

anatomy of the parts, great deliberation, and the most imperturbable coolness. None appreciated this more than Cheselden when he said: "If I have had more success than others, I do not im-

pute it to more knowledge, but to the happiness of a mind that was never ruffled or disconcerted, and a hand that never trembled during any operation."

Cheselden used a scalpel for both the superficial and deep incisions, but Frère Côme, a French lithotomist, invented (about the middle of the eighteenth century) "the lithotome caché" (Fig. 74),—a concealed knife, which was introduced closed into the bladder, then the blade was unsheathed, and the cut made by withdrawing the instrument thus opened. The intention was to give more precision to the prostatic incision.

For the same purpose Sir Caesar Hawkins invented the cutting gorget which for many years superseded all other instruments, and which is still used by some lithotomists in one form or another. Hawkins' gorget was subjected to numerous modifications, among the first of which was Dr. Physick's (Fig. 75). Dr. Physick sometimes used a double cutting gorget, when a freer opening was needed for the extraction of a large stone.

Baron Dupuytren then introduced the bilateral operation, making a curved transverse external incision, and adding an extra blade to Frère Côme's lithotome caché, in order to cut the prostate on both sides.

FIG. 74. Frère Côme's lithotome caché.



Dr. Alexander H. Stevens describes a prostatic bisector of his own, which "in form resembles a large olive, with a beak at the extremity, cutting edges at the sides, parallel to its long axis, and a straight handle."

The advantages he claims for this instrument are: "First, that the circular form of a transverse section gives an opening through the gland of three diameters instead of two, as when a flat instrument is employed:—thus it is not necessary to carry the incision so far laterally to obtain an opening of given dimensions; and hence there is less likelihood of hæmorrhage from injuring the plexus of vessels that surrounds the prostate.

Second.—The prostate is cut horizontally, and though not absolutely, yet for all practical purposes in its greatest diameter.

Third.—The rectum is pushed back by the convexity of the posterior part of the instrument.

Fourth.—As the prostate is stretched transversely across the instrument, the section is made by a clean cut, and with so little resistance, that the instrument does not, like ordinary gorgets, require to be thrust in with force, but may be passed lightly along until the section is completed. Thus there is less danger of wounding the fundus of the bladder by a sudden cessation of resistance from the parts divided; they are, in fact, divided without force.

Fifth.—The easy division of the prostate obviates the danger of tearing the cellular tissue which connects the anterior surface of the bladder to the posterior wall of the ossa pubis."*

Dr. Stevens' external incision was crescentic (the Celsian).

Dr. Wood performs the same operation with a similar instrument.

Dr. Post has also devised a prostatic bisector.



FIG. 75. — Dr. Physick's gorget.

* Lectures on Lithotomy, delivered at the New York Hospital, December, 1837. By Alexander H. Stevens, M.D. New York, 1838, p. 53 et seq.

The Instruments now used to perform lateral lithotomy are, a grooved staff, a scalpel, a probe-pointed scalpel, a long, straight, beaked bistoury, several pairs of forceps, a scoop, a syringe, and a canula.

The staff for an adult is ten inches from the point to the handle; the largest portion of the shaft of a size sufficient to distend the urethra moderately; the groove a little to the left, very deep, or rather, the grooved part a mere shell ending abruptly near the beak, and extending half way up to the handle. The curve of the instrument is longer and greater than that of ordinary sounds, and the handle two inches long and slightly excavated, to lodge the thumb, in order that the instrument may be held securely in position.

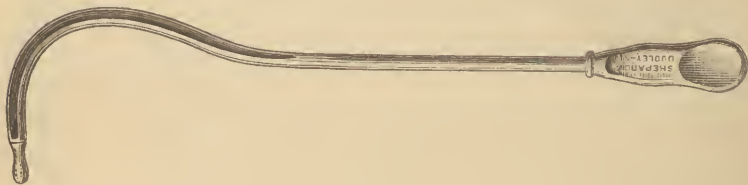


FIG. 76.

The scalpel has a firm, roughened handle four inches, and a blade three inches, in length, with a cutting edge of only one inch



FIG. 77.



FIG. 78.

and a half (Fig. 77). There is also a probe-pointed scalpel of the same construction. (Fig. 78.)

The *beaked bistoury* has a four-inch handle, and the blade is sharp to the shank (Fig. 79). This instrument bears the name of Sir William Blizard.

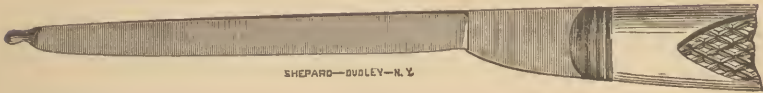


FIG. 79.

The *best forceps* are the plain-bladed (Fig. 80), over which, I



FIG. 80.

think, the fenestrated possess no advantage; the slightly curved are ordinarily the best; but in case of enlarged prostate, a greater curve is necessary. (Fig. 81.)



FIG. 81.

The *scoop* (Fig. 82) is constructed so as to subserve two purposes; that of removing small calculi or fragments, and of serving as a conductor for the forceps in cases where the wound is deep, or where there is prostatic hypertrophy, and the finger cannot reach the bladder. Formerly the blunt gorget was always employed for the purpose, and it is even now occasionally used.

The syringe.—The ordinary long-nozzled, eight-ounce India-rubber syringe answers the same purpose as the more costly brass instrument.



FIG. 82.

The canula (canule-à-chemise) is the same that has long been in use; it is about five inches in length, has two rings at the distal extremity for the attachment of tapes, and is notched about an inch from its vesical extremity that a piece of linen, sewed in the shape of a cone, may be attached, and picked lint or tow stuffed between the tube and the linen, and so make sufficient pressure to arrest venous oozing. A gum catheter will answer the same purpose. There should be at hand a very slightly curved steel searcher, an artery forceps, a tenaculum that can be dismounted from its handle, and some ligature silk.

These various instruments are arranged, in the order in which they may be required, upon a small table within reach of the operator.

The treatment preparatory to sounding will generally suffice as preparatory to the operation, except that, in addition, a brisk cathartic should be given on the previous day, and an enema a few hours before; and the perinæum shaved before the patient is placed upon the operating table. The patient is instructed to retain his urine for a couple of hours before the operation, if he can. The bladder should not be injected; there is no advantage in this, and it may do harm. In children I have often dispensed with the preparatory treatment, and have operated immediately after sounding, without any accidents; but it is better to adhere to the rule of preparing all patients.

Assistants.—There should be five assistants: one to administer the anæsthetic, two to hold the patient in position, one to sponge the wound, and, if necessary, tie a bleeding vessel, and one to hold the staff and support the scrotum; this is the post of honor, which should be confided to a person who is a good lithotomist, and will consequently attend strictly to the directions of the principal.

Operation.—The patient is first thoroughly etherized, and placed upon a firm, narrow table, a little higher than ordinary, covered with two or three thicknesses of blanket, over which a sheet of rubber cloth is thrown. His limbs may be bound by means of the lithotomy garter, or by the anklets and wristbands invented by Mr. Pritchard, of Bristol, England. Now, however, the patient is seldom confined by bandages, but is simply firmly held in position by assistants. The hips should be drawn to the extremity of the table so that the perinæum is fully exposed. Two assistants hold the thighs apart, with one hand applied to the inner side of the knee, and the other to the inner edge of the foot, and they should look that the pelvis is kept in proper line. The operator then introduces the staff slowly and cautiously, and touches the stone. If no stone is detected at the time, the operation should be postponed—all lithotomists agree upon this one point—and is not to be done until the calculus is felt, and the characteristic click resulting from its contact with the lithotomy staff distinctly heard by at least one person besides the operator. The presence of stone being thus demonstrated, the principal asks his leading assistant—who stands on the left of the patient, and behind the aid who steadies the leg—to hold the staff with his right hand, in the vertical position, exactly in the median line, to keep the curved portion of the instrument well hooked under the pubic arch, and not to allow it to deviate from this position from the moment of introduction to its withdrawal.

The surgeon, seated on a very low chair, takes a survey of the perinæum, feels the tuberosities of the ischia, and maps out the first incision. He then introduces his left index into the rectum, with the double object of examining the prostate and of exciting contraction of the gut.

First Incision.—The left index, removed from the rectum, is now used to feel the staff, through the thickness of the perineal tissues; then the point of the scalpel is deliberately plunged in, a little to the left of the median raphé, at one inch and a quarter anterior to the anal margin, until it reaches the groove of the staff, and inclining the edge to the left, the urethra is cut longitudinally for a space of about half an inch, and the incision completed by dividing the skin obliquely outward and backward to a point near the left ischial tuberosity.

Operators are cautioned, by nearly all surgical writers, against dividing the bulb of the urethra, on the one hand, and on the other, against wounding the rectum. It is well to shun both, but while trying to avoid one, the other is apt to suffer. The latter complication is unquestionably the more troublesome; the dangers of the former have been greatly exaggerated. I agree with Mr. Skey, that lateral lithotomy is seldom performed without implication of the urethral bulb, yet serious hæmorrhage is not a frequent sequel of the operation. In children I do not remember a single instance where I have not knowingly divided at least the posterior part of the bulb; and in many operations performed by others, that I have closely watched, I am sure the bulk has, in the great majority of cases, been freely divided. Recently, in an adult, who died a few days after the operation, from long-standing renal trouble, I was able to demonstrate that the surgeon, though he had tried to avoid the bulb, had divided it completely in its whole length, and there had been no excessive hæmorrhage during the operation.

I have, for the last twenty years, frequently rehearsed the operation on the dead subject, and often dissected the parts with the view of ascertaining the extent of injury done, and have almost always been able to show that the bulb had been divided at its posterior extremity. Even in the median operation the bulb is frequently cut.

The deep incision is usually made with the probe-pointed scalpel, or with Sir William Blizard's knife, but the cutting is often completed with the first instrument; in any case the knife is re-introduced, guided by the nail of the left index-finger, which is lodged in the groove of the staff, and the knife, slightly lateralized, follows the groove until the prostate and vesical neck are divided obliquely downward and to the left, to the extent required by the size of the stone. This step of the operation is often facilitated, if the surgeon takes in his left hand the handle of the staff, and depresses it, while at the same time he pushes the knife along the groove of the instrument into the bladder. In an adult who had a small stone, I divided only the anterior half of the prostate, and with small forceps extracted the calculus; the patient was able to retain his urine after the operation. A stricture of the urethra was the indication for the cutting operation, which relieved the patient of both his complaints. In several instances, in children, I only made partial division of the prostate; cutting through the anterior half, and dilating the neck of the bladder with small dressing forceps: they all passed urine at will, and recovered rapidly.

Extraction.—The cutting instruments are now laid aside, and the left index is passed along the staff into the bladder, and the exact position of the stone ascertained. The staff is withdrawn, the forceps are introduced beside the finger, and when they have reached the bladder, the blades are turned flatwise, then opened, and the lower blade is brought in contact with the *bas-fond*, and

the stone, if free, rolls into its concavity and is grasped, if possible, in its smallest diameter, and the process of extraction begins. The handles of the forceps are depressed, the instrument is rotated, that the surgeon may ascertain whether the vesical mucous membrane has been caught, and if nothing but the stone is included in the grasp of the forceps, moderate traction is made in the direction of the long axis of the superior pelvic strait, and the calculus removed and handed to a bystander, who washes and examines it, to ascertain whether it has any smooth facets, which are sure indications of the presence of other stones. Even if no such facets exist, the operator explores the bladder carefully with the finger, or with a searcher, and seizes and extracts another concretion, should it be detected; otherwise he injects into the bladder four or five ounces of tepid water and again explores.

Seizure of the stone is rendered very difficult if it happens to be lodged behind the pubic symphysis and firmly held by an irritable bladder, in which case the forceps must be withdrawn, the finger introduced, and the stone disengaged from this abnormal position. This often demands a great deal of patient manipulation, pressure with the other hand in the hypogastric region, and sometimes forceps curved almost at right angles. Encysted stones also cause much delay in the operation. In one instance I could not disengage the calculus until the edge of the cyst was torn by the finger-nail, but, fortunately, no accident occurred and the patient recovered.

After-Treatment.—The patient is put to bed—the mattress having been previously covered with rubber-cloth, over which several thicknesses of cotton sheeting, called the draw-sheet, have been spread. The folded towel, placed between the patient's thighs, to catch the urine as it flows, should be renewed every two or three hours, and the draw-sheet changed once or twice a day.

As soon as he has recovered from the anæsthesia, ten grains of quinine are given, and he is carefully watched by an attendant. For the first twenty-four hours he should lie on his back, but after that any position may be assumed. The wound heals by granulation in from two to six weeks—rarely by adhesion. During the first twenty-four hours the urine flows by the natural passage, owing to swelling along the tract of the wound. No dressings are applied. The bowels should not be disturbed for two or three days, when an enema may be administered.

Accidents of Lateral Lithotomy.—The principal accidents are: 1st, Failure to reach the groove of the staff, and consequent injury of adjacent parts; 2d, Wound of the rectum; 3d, Wound of the interior of the bladder; 4th, Hæmorrhage; 5th, Urinary fever; 6th, Infiltration of urine; 7th, Laceration of the neck of the bladder during extraction; 8th, Cystitis; 9th, Peritonitis; 10th, Pyæmia.

1. *Failure to reach the groove of the staff* leads to various injuries of the surrounding parts; the knife may penetrate the rectum, or may be thrust between this and the prostate, and finally enter the bladder, and in its course wound the vesicula seminalis, and, perhaps, the ureter. The infliction of such a wound would almost certainly give rise to fatal infiltration of urine. A case in point came to my knowledge where two fruitless attempts at lithotomy were made within two days: the patient, a child, died in consequence in a few days, and a good-sized calculus was found in the bladder.

2. *Wound of the rectum*, though not usually dangerous, is almost always followed by fistula. It happens when the gut is overloaded with fæces or flatus.

3. *Wound of the interior of the bladder*, now a very rare accident, occurred occasionally when the gorget was in use. In some instances the instrument has passed through the coats of the

bladder into the peritoneal cavity, wounding the intestines, and, in one instance, the liver.

4. *Hæmorrhage*.—Excessive hæmorrhage is not a common accident of lithotomy. It occurs from a wound of an abnormally situated artery of the bulb, from an extensive wound of the bulb itself, from wound of the accessory pudic artery, when that vessel happens to lie on the side of the prostate and extends to its apex, and very rarely from wound of the pudic artery, which accident has been known to happen from lateralizing the knife too much. I once witnessed a case of fatal hæmorrhage from this cause. Another serious cause of hæmorrhage is the persistent venous oozing which occasionally takes place after lithotomy in old men with enlarged prostate. Retrocedent hæmorrhage, or the passage of blood into the bladder, sometimes to the extent of filling it, should be looked for, especially in old men, and measures taken for its arrest, which should consist of styptics and plugging of the wound with the aid of the *canule-à-chemise*.

5. *Urinary fever* rarely occurs in patients that are properly prepared for the operation, and then it is of the milder type; the severer type attacks patients who are affected with long-standing renal disease, and the advent of the febrile reaction is the precursor of a fatal termination. For the management of such cases, see Chap. II., section on urethral fever.

6. *Infiltration of urine* is one of the most uncommon, but at the same time one of the most dangerous accidents of lithotomy. Very soon after the operation, the urine may insinuate itself into the tissues surrounding an insufficient or improperly made wound. The infiltration may be superficial or may extend into the pelvis, as when the prostate is too freely divided and the pelvic fascia is wounded. The progress of this trouble is very rapid—in a few hours the skin becomes boggy, erysipelatous, and finally crackles under pressure, and extensive sloughing may ensue unless the

wound is enlarged soon after the infiltration is discovered. In case, however, the pelvic connective tissue is extensively involved there is little hope of a favorable termination; still, antiseptic injections and attention to cleanliness should be observed, and the patient properly nourished and stimulated.

7. *Laceration of the Neck of the Bladder*.—This accident occurs either from wrong direction given to the forceps in the extraction of a medium-sized, or even a small calculus, or, as is most commonly the case, in attempting to remove entire a large-sized stone, and the consequences of such an injury are often fatal. The attempt to extract large calculi entire, by any of the methods of perineal lithotomy, cannot be too strongly denounced. The time will soon come when surgeons will take a special pride in showing detritus rather than specimens of large urinary calculi.

8. *Cystitis*, although regarded by most authorities as a rare accident, is asserted (by Boyer) to be the cause of three-quarters of the deaths.

9. *Peritonitis* is a more frequent accident in children than in adults. The anatomical relations of the bladder in the former is perhaps an explanation of the fact.

10. *Pyæmia* is one of the great occasions of mortality, especially in hospitals and in persons of advanced age.

ALLARTON'S MEDIAN LITHOTOMY.

This operation is the "Marian" revived, but improved, simplified, and rendered much safer than the other methods of lithotomy. Sir Astley Cooper, Manzoni, and De Borsa have suggested improvements in, and performed the median operation, but our profession is indebted to Mr. George Allarton, of South Molton, England, for introducing and popularizing the improved mode of operating which so justly bears his name. It differs from the ancient Marian

operation in the following important particulars: first, the wound is small and in the median line; secondly, the membranous and not the spongy portion of the urethra is incised; thirdly, the prostate is dilated and not lacerated; fourthly, the finger, and not the blunt gorget, is used to effect dilatation; fifthly, large stones are not to be removed entire, but broken up and the fragments extracted.

The following is the description which Mr. Allarton gives of his operation, published in 1854, in a pamphlet bearing the title of *Lithotomy Simplified*:

"I introduce a grooved staff in the usual manner, and of the usual size, and confide it to an assistant, with directions to keep it perpendicular and hooked up against the pubes; I then introduce the index-finger of my left hand into the rectum, placing its extremity in contact with the staff, as it occupies the prostate, and press it firmly against the staff, so as to steady it; then, with a sharp-pointed straight knife, with a tolerably long and rough handle, I pierce the perinæum in the middle line, about half an inch above the anus, or at such distance as may appear necessary to avoid dividing the fibres of the external sphincter,—I carry the knife steadily and firmly on till it strikes the groove of the staff, the deep sphincter lying between the knife and the directing finger, which enables me to judge of the distance as the knife passes along. If the incision be not made exactly in the median line, the contracting fibres of the injured muscles draw the point of the knife from its direct line and interfere with the accuracy of striking the staff, hence the advantage of the rough-handled knife, which affords a firmer hold and better purchase. Having struck the groove of the staff, I move the point of the knife*

* It should be observed that the knife has a lancet point—so that this movement slightly nicks the prostate, and enables the finger to enter it more readily. (Allarton.)

along the groove towards the bladder a few lines, and then withdraw it, cutting upwards, so as to leave an external incision of from three-quarters of an inch to one inch and a half, according to the presumed size of the stone;—the escape of urine indicates the entrance to the urethra. I then introduce a long ball-pointed probe or wire through the external opening into the groove of the staff and slide it into the bladder, to sufficient depth to insure its safe lodgment in that viscus, and withdraw the staff. I then well grease the index-finger of the left hand and pass it along the probe, with a semi-rotary motion, through the prostate into the bladder; which procedure is achieved without difficulty, and when the stone is free, it comes at once in contact with the finger, and, if of moderate size, passes at once into the wound on withdrawing the finger, the patient having power to strain upon and thereby facilitate the extraction of the stone; this last-mentioned power being one of the great advantages of the operation. The incision being made strictly in the median line, no muscles are divided, and the integrity of the bladder being preserved, it is under the control of the patient, who exerts, at the wish of the surgeon, a powerful propulsive effort which keeps the stone in or in contact with the internal extremity of the wound, where it is easily seized by the forceps and extracted by mild persevering traction. Now, as the aperture is necessarily the size of the finger which produces it, if the stone be large, some other dilating power must be employed in addition to the dilating effect of the forceps and stone combined;* for this purpose, Weiss' three-bladed

* Since writing the above, I (Allarton) have come to the conclusion that no other dilator than the finger is necessary. The aperture thus made admits the forceps readily, and the forceps with the stone in its grasp forms an excellent conical wedge—amply sufficient for all purposes when the calculus is not too large; and when it is too large, it ought by all means to be broken or crushed. I have quite abandoned the dilators, etc., etc. *A Treatise on Median Lithotomy*, etc., by George Allarton, M.R.C.S. London, 1863. P. 123.

female dilator, Arnott's hydraulic dilator, or what is at once ready and effective, the addition of the vulcanized India-rubber finger stalls one over another, until the finger is sufficiently enlarged for the purpose, the outer covering being well lubricated with lard before being introduced. But Arnott's dilator, where it can be procured, is by far the most efficacious, though not the most expeditious means. Should the stone be of unusual size, it may be readily broken by a short, strong, and straight lithotrite, or by a strong and suitable pair of forceps closed by a screw, if the stone be soft and yielding—I say readily, because the stone is, in this operation, within so short a distance of the external aperture that mechanical aid can be brought to bear upon it without the slightest difficulty or risk; again, should the stone resist the efforts to crush or extract it, the wound can readily be enlarged upwards or downwards, by dividing the deep fascia, or even be converted into a bilateral aperture sufficient to extract any average sized stone."

Mr. Allarton claims for this operation the following advantages:

"The impossibility of missing the bladder; the smaller amount of cutting than in the lateral operation—the neck of the bladder being uninjured; the smaller amount of blood lost—the prostate being merely dilated, not incised; the urine being at once passed by the urethra as well as by the wound, unless union by the first intention be effected; the facility with which the stone is reached, the patient being able to propel it toward the wound; the very short distance between the external opening and the interior of the bladder; the capability of breaking or crushing the stone, and washing out the bladder, and freeing it from any minute particles; the small amount of pain; the absence of danger from urinary infiltration; no muscle or vessel of any consequence being divided, no subsequent imperfection can arise; no danger of wounding the rectum; the rapid recovery, the patient being able to go about the next day; and the great facility with which the

operation can be done by any practitioner of ordinary skill and ability."

He asks that the following directions be observed in the performance of the operation :

"Have your knife straight and narrow-bladed, with long handle; have a good long ball-pointed probe; take care to pare the nail of the dilating finger, so as not to injure the prostate; employ plenty of grease to lubricate the finger; and mind that the probe is well in the bladder before you withdraw the staff."

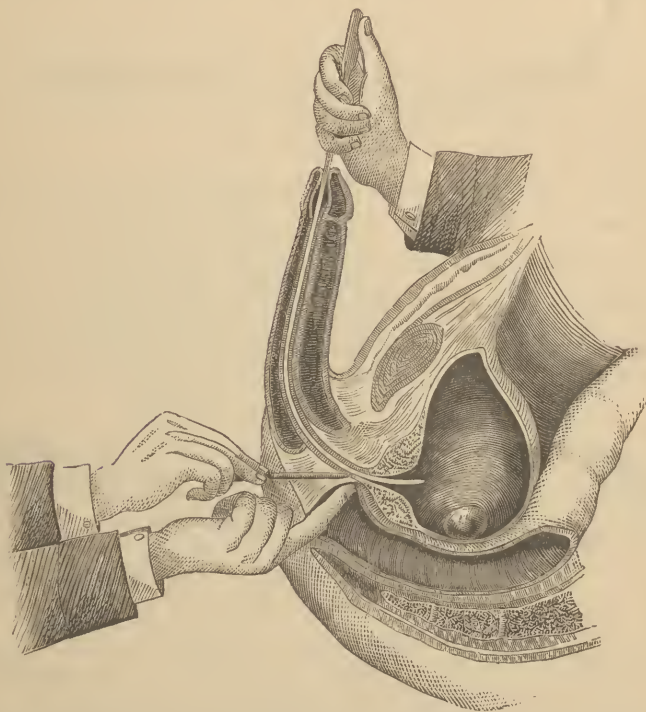


FIG. 83. Reduced in size from Dr. Little's paper on median lithotomy. showing the staff held in position; the left index, in the rectum, resting against the apex of the prostate, and the knife plunged in the membranous portion of the urethra.

Mr. Allarton's strong recommendation to break up calculi which, from their size, cannot be safely extracted, is too often disre-

garded by many who do the median operation. They are anxious to remove all stones entire, for fear that the smallest fragment left in might become the nucleus of a new concretion—losing sight of the greater danger of lacerating the vesical neck.

Doctors Walter, Markoe, and Little have done much to popularize median lithotomy in the United States, and have made improvements tending to simplify the operation.



FIG. 84. Dr. Markoe's staff.

Dr. Markoe, finding it sometimes difficult to strike the groove of the ordinary lithotomy staff, has substituted the instrument (Fig. 84) which has a very shallow and broad groove that can scarcely ever be missed by the knife. The groove is continuous to the vesical end of the staff, to facilitate the passage of the probe or director into the bladder.

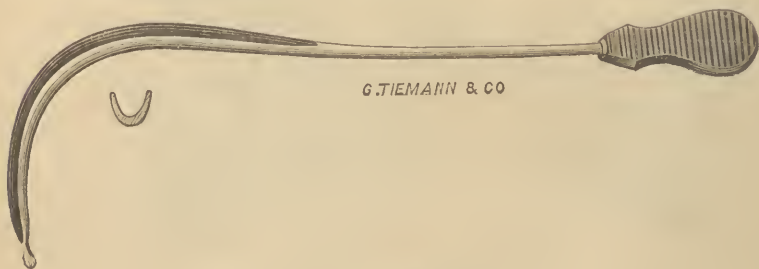


FIG. 85. Dr. Little's staff.

Dr. Little now uses a broad but deeper grooved staff (Fig. 85), which he thinks possesses some advantages over Dr. Markoe's.

1. The curve is such as to be more easily reached by the knife.

2. The depth of the groove makes complete division of the membranous portion of the urethra more certain.



FIG. 86. Dr. Little's director.

Another useful instrument of Dr. Little's is the director (Fig. 86), which he uses instead of Allarton's probe. "It is about six inches long, with a flat tapering groove, terminating with a probe-point. The handle is set at an angle of forty-five degrees, so that the hand holding it is out of the way, while the finger of the other hand is dilating the opening. This instrument is passed

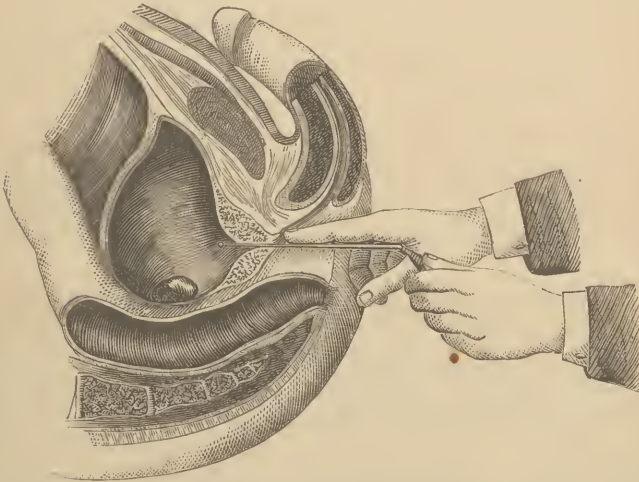


FIG. 87. Reduced in size from Dr. Little's paper, showing the director in position and the right index entering the prostatic portion of the urethra.

along the groove of the staff after the knife is withdrawn, and serves as a guide for the finger or forceps on entering the bladder."*

* A paper on Median Lithotomy, by James L. Little, M.D., etc., etc. Transactions of the American Medical Association, 1870.

Mr. Allarton, and nearly all those who have done the operation, prefer now to make the dilatation of the prostate with the finger. This is safe enough in adults, but in children there is danger of severing the urethra from the prostate. I know of two cases where the accident happened. This untoward result may be avoided by using, in all cases, Dolbeau's excellent dilator (Fig. 89), which is very small at the point, and has six branches that may be sheathed by a thin India-rubber stall, to protect the tissues from any possible injury.

MEDIO-LATERAL LITHOTOMY.

This operation was introduced by Dr. Buchanan, of Glasgow, in 1847. He was induced to adopt it on account of the dangers of lateral lithotomy, which he has sought to avoid by opening the membranous portion of the urethra upon an angular staff, carrying the knife along its groove into the bladder, and cutting the prostate laterally.*

Mr. Henry Lee's mode of performing the medio-lateral operation is simpler, more easily executed, and in other respects preferable to Dr. Buchanan's. It is described in the *Lancet*, November 28th, 1868, p. 627, as follows:

"The patient, for this operation, is placed in the ordinary position for lithotomy, and a grooved staff is introduced into the

* For a full description of Dr. Buchanan's operation the reader is referred to Sir Henry Thompson's treatise on lithotomy and lithotrity, second edition, London, 1871. P. 63.

Our countryman, Professor Nathan R. Smith, of Baltimore, described a similar operation,—*Medical and Surgical Memoirs of Nathan Smith, M.D., Baltimore, 1831: p. 256 et seq.*,—which he performed with the aid of an ordinary grooved staff, having a hinged director to insure the entrance of the knife into the membranous portion of the urethra. A few years afterwards he used an angular staff with a sliding index and other improvements. According to Thompson, Sir James Earle used an angular staff in lithotomy, which he describes and figures. "*Practical Observations*," 2d edition, London, 1803.

bladder; the skin of the scrotum is held moderately tight by an assistant; an incision is then made in the median line of the perineum from before backwards. This should extend through its posterior half, terminating two or three lines in front of the anus. From this point the incision is continued for a quarter of a circle round the front and left side of the rectum. The finger of the left hand may then be put into the wound, and the rectum pressed back, whilst an additional touch or two with the knife separates it still further from the parts in front. The forefinger of the left hand is now passed into the rectum, and the knife, with its back toward the bowel, is passed, at the posterior part of the central incision, into the membranous portion of the urethra. With the finger as a guide, this is done with great ease and certainty. A bistoury or a knife, with a probe at its extremity, is then passed into the same opening, and made to slide along the staff into the bladder. The forceps or any other instruments that may be used are also introduced more directly into the bladder

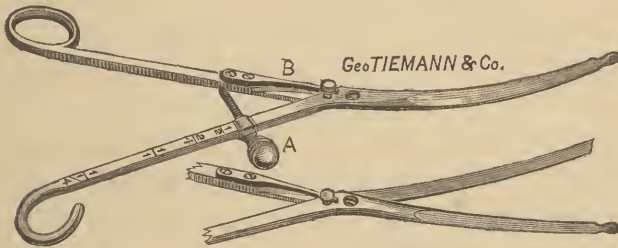


FIG. 88. Professor Briggs' lithotome.

than in the lateral operation. The incision of the prostate is made from within outward. In children a single incision with the scalpel is sufficient, but in adults the circular part of the wound should be deepened either before or after the urethra is opened."

Mr. Lee thinks his operation "the simplest in conception, the

easiest in execution, and, of all the operations for lithotomy, the least liable to be attended by unfavorable complications."

Professor Briggs, of Nashville, has lately devised a very simple and ingenious lithotome (Fig. 88) which may be made with one or two cutting blades, and used with advantage in either the medio-lateral or the medio-bilateral operation. It seems to me that Mr. Lee's idea of cutting the prostate from within outwards, can be carried out with greater precision by means of this instrument than by an ordinary beaked knife.

The medio-lateral operation is especially indicated in cases complicated with severe cystitis and inordinate irritability. The opening made in this operation, though smaller than in the lateral, is sufficient to drain the bladder, and to permit the passage of a catheter or tube through which pure or medicated water can be injected.

Results of Lithotomy.—The statistics given below, obtained from various reliable authorities, show the results of lithotomy in hospital as well as in private practice, and also those of special operations. The largest authentic collection of cases ever made is Mr. William Coulson's, which embraces the results of operations performed in Great Britain and Ireland, France, Germany, Austria, Italy, Russia, Denmark, Sweden, and the United States. It consists of 6,505 cases of all lithotomy operations, at all ages, both in males and females, exhibiting a mortality of one in six and fifty-six one-hundredths.

Professor Gross' collection comprises 1,929 operations of lateral lithotomy, by a number of eminent surgeons, with 187 deaths, or one in ten and thirty-one one-hundredths. Professor Gross himself has operated one hundred and fifteen times, and has lost ten patients, or one in eleven and five-tenths.

Sir Henry Thompson's table of 1,827 cases operated upon (lateral method) in England, shows a mortality of one in about eight.

The results of lithotomy, like those of all other surgical operations, are, for obvious reasons, much more favorable in private than in hospital practice.

Of 547 cases in private practice, collected by Mr. Coulson, twenty-five died, or one in twenty-one and eighty-eight one-hundredths. Of 426 cases (Dr. Gross') of lateral lithotomy performed with the gorget, in private practice, by American surgeons, the mortality was one in twenty-three and seven-nineteenths. The late Dr. B. W. Dudley, of Lexington, Kentucky, whose cases were mostly in private practice, operated two hundred and seven times, and lost only six patients, or 1 in 34.5. Dr. Valentine Mott had reached his fiftieth operation with only one death.

It will be well now to cast a glance at the results of special methods of lithotomy. According to Coulson, the mortality after the *apparatus major* is one in four and eighty-nine one-hundredths; the supra-pubic operation, one in three and eight one-hundredths; Cheselden's operation, one in seven and thirty-eight one-hundredths; the recto-vesical method, one in four and eighty-seven one-hundredths; the bilateral method, one in four. Professor Paul F. Eve, of Nashville, Tenn., has had much better results than the above—perhaps the best on record in the bilateral operation. In his report of one hundred cases of stone in the bladder, he states that eighty-seven were subjected to the bilateral operation, of which eight died, or one in ten and seven-eighths.*

These operations, with a few exceptions, were performed in private practice.

The median operation has given better results than any other method of lithotomy, especially in the United States.

* Transactions of the American Medical Association, vol. xxii., 1871, p. 269 et seq.

Mr. Allarton's table,* of 170 operations, shows a mortality of fourteen, or 1 in 12.13. Of these 170 operations, 59 were performed on patients ranging from the age of $1\frac{1}{2}$ to 9 years, with two deaths; 17, from the age of 9 to 14, one death; 4, from the age of 14 to 19, all recovered; 26, from the age of 20 to 47, two deaths; 13, from the age of 52 to 60, one death; 27, from the age of 61 to 69, seven deaths; 7, from the age of 70 to 77, all recovered; and in 17, age not specified, one death.

Dr. James L. Little, in his paper on median lithotomy, has tabulated 96 cases by American surgeons, with three deaths, or 1 in 32. Since the publication of this paper, Dr. Little and a number of other surgeons have performed the operation, and it may be interesting to note the results. Dr. Little's statistics, together with the additional cases furnished me by the operators, are reproduced below in tabular form.

Of these cases, 139 in number, 60 were from $1\frac{1}{2}$ to 10 years of age, one of which died; 25, from 10 to 20 years, one died; 54, from 20 to 70, three died.

If to the American cases, which show the smallest number of deaths, are added Mr. Allarton's 161 cases,—nine belonging to Dr. Walter, of Pittsburg, Pa., are subtracted from the 170 cases in Mr. Allarton's table, because they are included in the table of American cases,—which may be considered as showing the medium, and the Norfolk and Norwich hospital cases, which show the largest number of deaths, the average death-rate obtained from the aggregate ought to satisfy those who have been inclined to decry the operation.

* Allarton, *Modern Median Lithotomy*, etc., London, 1863, p. 499 et seq. It is urged that Mr. Allarton's reported cases do not in the least represent the actual state of affairs, etc., etc. I quote his statistics as I find them in his book, and leave all controversial points to be settled by our surgical brethren on the other side of the Atlantic.

American cases	139 operations,	5 deaths,	or 1 in 27.8
Part of Mr. Allarton's table*	161	"	14 " 1 in 11.5
Norfolk and Norwich hospital	64	"	13 " 1 in 4.92
Aggregate,	364	"	32 " 1 in 11.37

TABLE OF AMERICAN CASES OF MEDIAN LITHOTOMY.

OPERATOR.	NO. OF CASES.	RECOVERED.	DIED.
Dr. A. G. Walter, Pittsburg, Pa.	64	63	1
Dr. T. M. Markoe, New York.....	19	19	
Dr. J. L. Little, "	20	18	2
Dr. J. T. Kennedy, "	8	8	
Dr. C. M. Allin, "	1	1	
Dr. Gurdon Buck, "	1	1	
Dr. Edw. Bradley, "	1	1	
Dr. Erskine Mason, "	2	2	
Dr. J. Grafton, "	2	2	
Dr. R. F. Weir, "	1	1	
Dr. J. S. Thébaud, "	3	3	
Dr. Chs. C. Lee, "	1	1	
Dr. F. D. Lente, "	1	1	
Dr. Chs. Stokes, "	1	1	
Dr. J. B. Cutter, New Jersey.....	1	1	
Dr. E. Krackowizer, New York.....	3	3	
Dr. J. H. Pooley, "	2	1	1
Dr. J. G. Goodridge, Brooklyn, N. Y.....	1	1	
Dr. W. C. Livingston, New York.....	2	2	
Dr. H. O. Hitchcock, Michigan.....	1	1	
Dr. W. H. Van Buren, New York.....	1	1	
Dr. J. J. Hull, "	1	1	
Dr. J. C. Hutchison, Brooklyn, N. Y.....	1	1
Dr. Paul F. Eve, Tennessee.....	1	1	
Total	139	134	5

Medio-lateral method.—Dr. Buchanan claims for the medio-lateral operation, performed upon the angular staff, a mortality of 1 in 10.4.

* The nine cases subtracted from Mr. Allarton's 170 cases were all successful.

CHAPTER XV

PERINEAL LITHOTRITY.

THE name of perineal lithotritry was given, in 1862, by Professor Dolbeau, of Paris, to an operation completed in one sitting, by which the membranous portion of the urethra is opened, the prostate and neck of the bladder dilated instead of being cut, and a large stone crushed, and the fragments immediately extracted.*

The great dilatability of the vesical neck had long been discovered, but very few applied the discovery to the treatment of calculous patients, and many feared to attempt dilatation, on account doubtless of the fatality of the Marian operation, in which there was always laceration, and not expansion. Mr. Dolbeau, however, by patient experimentation, ascertained the extent to which dilatation of the vesical neck could be safely carried, and upon it is based the success of his operation. This resembles some of the old and rejected operations, but careful analysis of its various steps will show that it is really new.

Incision of the urethra and dilatation (?) of the prostate originated in the sixteenth century, but Mr. Dolbeau incises the membranous and not the spongy portion—as in the Marian operation. He dilates, with the greatest care, the neck of the bladder, without cracking even the mucous membrane, and uses for that purpose an ingeniously contrived six-branched instrument, instead of forcing in the blunt gorgets used in the *apparat* major.

* Dolbeau. *Traité pratique de la Pierre dans la Vessie*. Paris, 1864. P. 346 et seq.

Sir Astley Cooper, with the assistance of the Arnotts, after incising the perinæum, made gradual dilatation by fluid pressure, and in thirty hours extracted a calculus the size of a walnut—but Mr. Dolbeau dilates in a few minutes, without tearing.

Dr. Willis proposed an external urethrotomy in the membranous region, and gradual expansion, with Arnott's dilator, sufficient to extract a moderate-sized calculus, and named the operation "lith-ectasy or cystectasy."* He advised fragmentation of large calculi, and his operation is the nearest approach to perineal lithotriety.

Mr. John Douglas (1727) is quoted by Dr. Willis as proposing to gradually dilate fistulæ in perinæo with sponge or gentian tents, until a pair of forceps could be introduced into the bladder and a small stone extracted. Bonisson, of Montpellier, performed lithotripsy in several sittings, through fistulæ in perinæo, previously dilated or incised, and also named his operation perineal lithotriety.

Mr. Allarton, in median lithotomy, makes a small perineal incision, but dilates the prostate with the finger, while Mr. Dolbeau insists that the finger must not be introduced at all.

The incision in Mr. Dolbeau's operation is smaller and nearer the anal margin than in any of those above mentioned ($\frac{1\frac{3}{8}}{1}$ of an inch in length); dilatation is made from the skin to the bladder, and the whole track is nearly cylindrical. I believe this method of operating is destined to supersede Mr. Allarton's.

Fragmentation of large calculi during lithotomy, dates as far back as the time of Ammonius of Alexandria, who lived two hundred and seventy-six years before the Christian era, and who made use of a sculptor's chisel, introduced through the perineal

* Willis on the treatment of stone in the bladder by medical and mechanical means. London, 1842. P. 160 et seq.

wound, to break up by sharp blows stones too large to be extracted entire.

Franco, Paré, Covillard, Lecat, the Colots, Heister, Frère Côme, all used strong forceps, more or less clumsy, to break up large stones during lithotomy.

Among the moderns, Civiale, Willis, Nélaton, Allarton, and others have advocated fragmentation of large calculi. Malgaigne describes the combination of lithotomy and lithotripsy under the name of lithotriptic lithotomy,* and traces it to its origin in remote antiquity.

Mr. Dolbeau's method of breaking up calculi through the dilated prostate differs from all of those mentioned above. He uses strong but small forceps, that can be opened without injuring the vesical neck, and with them reduces the stones to very small fragments and to dust, and immediately extracts the débris, by means of very small forceps or with the scoop.

He concludes, from his experiments on the cadaver, that the vesical neck cannot be dilated beyond a diameter of twenty millimetres (thirteen-sixteenths of an inch) without tearing the mucous membrane and prostatic tissue, and that the opening made by his dilator is sufficient to admit lithoclasts strong enough to destroy calculi of considerable size.

The Dilator (Figs. 89, 90, 91) is composed of six uniform metallic branches, which are kept together by an India-rubber band when the instrument is closed.

Fig. 90 represents the dilator in its natural size, which is twelve millimetres in diameter at the largest part. The vesical end is conical, and is surmounted by a small metallic hood, which covers the free extremities of the six branches, and fits in the groove of

* Malgaigne. *Thèse de concours. Parallèle des diverses espèces de taille.* Paris, 1830. P. 68.

the staff. In the centre of the branches there are two spheres attached to a stem, which extends from the hood at the vesical



FIG. 89.

FIG. 90.
Dolbeau's Dilator.

FIG. 91.

extremity, to terminate by a screw-thread in the handle. When the handle is turned the spheres are pushed forward from

their concealed position, and the instrument is gradually developed to twenty millimetres (Fig. 91). Originally Mr. Dolbeau covered the dilator with a rubber stall, but now he thinks this precaution unnecessary.

The instruments necessary to perform perineal lithotripsy are: A broad, deep and centrally grooved staff; a strong, straight lancet-pointed bistoury, such as that used in median lithotomy; a six-branched prostatic dilator; three or four lithoclasts of different shapes and strength; two or three pairs of small, straight and curved forceps; a scoop; and a long-nozzled rubber syringe. Mr. Dolbeau advises that in addition to the above-named instruments, the following should be within reach in case unforeseen difficulties should occur during the operation: A beaked bistoury, a single or double lithotome, a blunt gorget, strong forceps, and a *canule-à-chemise*.

Operation.—The description Professor Dolbeau gives of his operation is substantially as follows:—It comprises three principal steps: 1st. The opening of the bladder; 2d. Lithoclasty, or fragmentation of the stone; 3d. The extraction of the débris.*

1. Opening of the Bladder.—The patient, having been properly prepared, is etherized and placed in the lithotomy position. The staff is introduced and confided to the principal assistant, who holds it firmly and perpendicularly in the median line and well hooked under the pubic arch. An incision, two centimetres (about $\frac{1}{8}$ of an inch) in length, is made in the median raphé, extending to the anal margin and involving the skin and superficial fascia. The deep fascia is next incised; the left index fingernail is then pressed into the groove of the staff, and the membranous portion of the urethra is punctured with the knife, care

* Dolbeau. De la Lithotritie Périnéale, ou nouvelle manière d'opérer les calculs. Paris, 1872. P. 47 et seq.

being taken to avoid the bulb on one side, and the rectum on the other. The urethral incision is only five or six millimetres in length. I see no reason why the knife should not be plunged into the urethra through the skin, as in Allarton's operation.

Dilatation.—In most cases the dilator can be introduced into the bladder at once; but Mr. Dolbeau prefers, for safety's sake, to make dilatation in three steps, the first of which consists in inserting the point of the dilator into the groove of the staff, and fixing it in a direction perpendicular to the plane of the perinæum. (Fig. 92.)

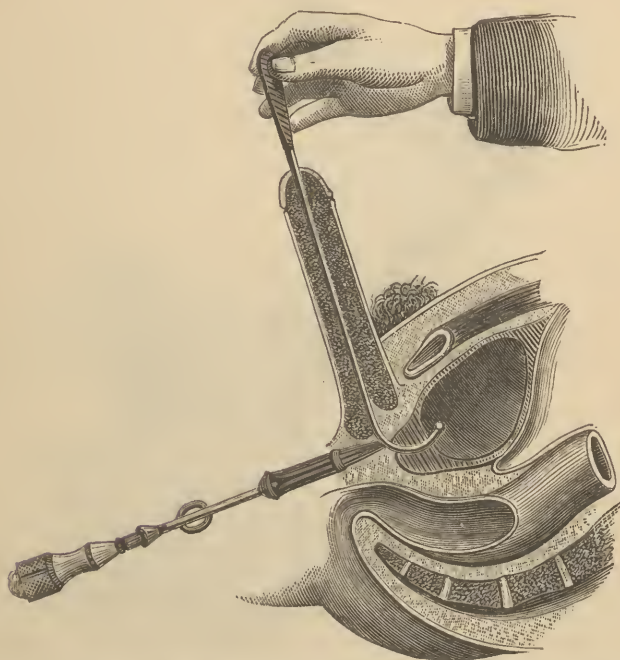


FIG. 92. From Dolbeau. Showing the relative positions of the staff and dilator during the first step of dilatation.

The staff is held firmly in position, that there may not be the slightest deviation of either instrument, and that it may serve as a fulcrum for the dilator; and, during dilatation, the assistant

should constantly resist the strain arising therefrom. The dilators should be opened very slowly, although during this step scarcely any obstacle is encountered, as the tissues yield readily, and the passage is made immediately.

Methodical divulsion of the urethra, and the crowding back of the tissues from the skin to the urethral rent being thus secured, there is an artificial canal large enough to allow the instrument, after it is closed, to enter the prostatic urethra (Fig. 93); then



FIG. 93. From Dolbeau. Showing the relative position of the staff and dilators during the second step of dilatation.

begins the second step of dilatation, in which the surgeon, holding in his right hand the dilator, in contact with the groove of the staff, takes the handle of the latter in his left hand and depresses

it to an angle of about one hundred and thirty degrees (Fig. 93). This depression of the staff causes the point of the dilator to be carried nearer the vesical neck. In this new position of the instruments the perineal wound is again slowly dilated.

At the termination of the second step, the dilator is closed and the staff removed, but the former is left in position, that the third and last step of dilatation may be accomplished. The dilator may have to be employed two or three times, in order to make the perineal wound sufficiently patent.

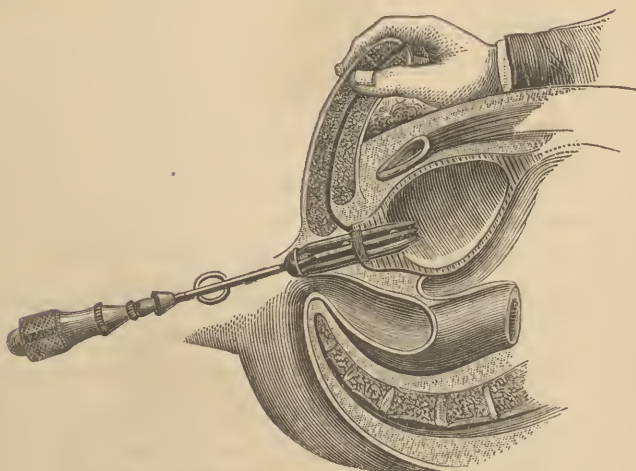


FIG. 94. From Dolbean. Showing the third step of dilatation.

In the third step, also, the introduction of the dilator and its opening must be very slow. Often only its conical extremity can be engaged in the neck of the bladder; when this happens, no violence or haste must be used. It is sufficient to dilate very slowly, then to close the instrument, when it will be comparatively easy to introduce it into the bladder. The dilatation of the vesical neck is then proceeded with, always slowly, stopping each time there is any great resistance. After the dilator is developed

to its fullest extent (20 millimetres), it is gently withdrawn, its six branches remaining open (Fig. 94).

Mr. Dolbeau, to be more explicit, says that the surgeon should dilate in accordance with the degree of resistance he finds. In some cases there is no resistance of any account, while in others it is with the greatest difficulty that the branches of the instrument can be opened. In such instances it is necessary to proceed with the greatest caution. During the whole manœuvre the dilator frequently touches the calculus; this is very important, as it makes the surgeon certain that the instrument has entered the bladder, and not a false route. At the conclusion of the last step of dilatation, Mr. Dolbeau is in the habit of introducing a small, straight lithotomy forceps, to ascertain the size and hardness of the stone. If the calculus does not exceed two centimetres in diameter, he extracts it entire, otherwise he proceeds to lithoclasty. In some cases he has been able to reduce to fragments, with this small forceps, large phosphatic stones. After dilatation in the cadaver, he has uniformly found a longitudinal rent, extending from the puncture in the urethral floor to the right of the utriculus, but never farther back, the vesical neck being always simply dilated. He seems to prefer divulsion of the membranous urethra to its complete division with a knife, perhaps with the idea that a free incision to the apex of the prostate might lead to extension of the rent to the neck of the bladder. He has observed that the vesical neck did not usually retain for a very long time the degree of dilatation to which it had been subjected. This tendency to contraction has also been noticed after median lithotomy; in many instances the patients have been able to pass urine at will on the next day, and sometimes within a few hours.

2. Lithoclasty.—This step of perineal lithotrity has, according to Mr. Dolbeau, for its principal and essential basis, the following proposition: The great danger in the operations of peri-

neal lithotomy is the extraction of a calculus too large, considering the restricted dimensions of the neck of the bladder. Security then resides in fragmentation of the stone. In this manner the



Fig. 95.

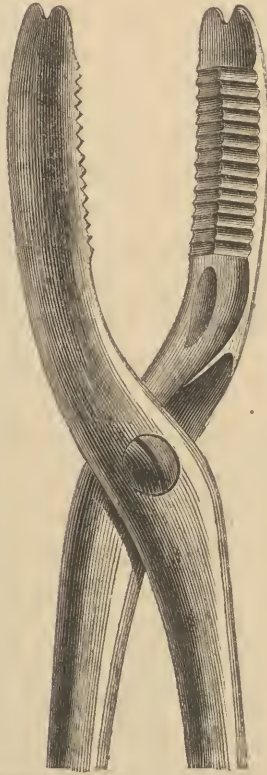


Fig. 96.

SREPARQ—DUDLEY, N. Y.

Dolbeau's lithoclast.

fragments extracted are proportioned to the canal by which they pass, and it may be said that, as a rule, calculi which exceed two centimetres should be broken up.

"Fragmentation of the stone has been theoretically accepted by numerous surgeons who still practise lithotomy. However, they reserve lithoclasty exclusively for very large stones. With the majority of operators, lithoclasty intervenes only after efforts at traction have failed to bring out the stone through the vesical neck, already incised in various directions. Extreme distension of the vesical neck is to be dreaded, as it is very often accompanied by more or less deep lacerations."*

Mr. Dolbeau considers lithoclasty through the perinæum as a difficult and laborious manœuvre, partly on account of the instruments used for the purpose. He states that fragmentation of stones by a perineal wound with the curved lithotriptors is always very difficult, and sometimes impossible; and advises young surgeons to rely little upon these curved instruments, although theoretically they seem to offer great resources to the combination of lithotomy and lithotripsy. He used, in his early operations, a short and strong curved lithotriptor, but has since given it up for the forceps (Figs. 95, 96) described below.

In his opinion the best lithoclast is a forceps which seizes the stone with ease, and at the same time offers sufficient resistance to break it. The problem he had to solve was the possibility of making a very powerful forceps of a relatively small size. He has succeeded in having such an instrument constructed. The new lithoclast, he says, is a small lithotomy forceps whose handles are made like those of the English forceps. The entire length of the instrument (Fig. 95) is thirty-eight centimetres. The handles are much longer than those of ordinary forceps, and can be further lengthened by a simple mechanism. The beak is such that, when closed, it can pass through a canal of two centimetres in diameter. The instrument is made of well-tempered steel, the

* Dolbeau. De la lithotritie périnéale, etc. Paris, 1872.

jaws are thick and short (six or seven centimetres), and their power very great, on account of the situation of their articulation.



Fig. 97.



Fig. 98.

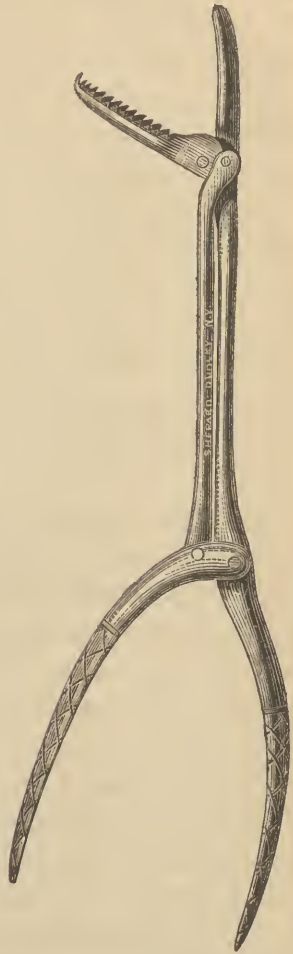


Fig. 99.

The author's lithoclast for perineal lithotritry.

There are two strong teeth at the extremity of each jaw (Fig. 96), that large calculi may be gnawed and destroyed from the circum-

ference towards the centre, and sufficiently reduced in size to be seized and broken up. The male blade of the lithoclast has a prominent longitudinal crest (Fig. 96), and the female is slightly concave, and has small peripheral teeth to prevent the stone from slipping away.

Mr. Dolbeau's instrument is susceptible of improvement in the following particulars: The jaws should be shortened, and the articulation and disposition of the handles should be slightly altered, in order to prevent over distension, and perhaps rending of the vesical neck, when the instrument is opened. These defects exist in the instrument "definitely adopted" by Mr. Dolbeau, and though they can be easily remedied, it occurred to me that the instrument whose handles would retain their parallelism near the articulation when the jaws are open, would be least likely to contuse, distend or tear the vesical neck, and I think I have found the right method of fulfilling these conditions. My lithoclast (Figs. 97, 98, 99), modelled after Mathieu's double-lever urethral forceps (Figs. 72 and 73, chap. XIII.), while it is smaller than Mr. Dolbeau's forceps, is quite as strong, and is capable of fracturing the hardest calculi. The jaws are shorter than those of his instrument, and can be opened to the extent of two inches, without in the least augmenting the calibre of the shaft. Fig. 97, reduced in size, shows the instrument closed for introduction; Fig. 99 represents it open for seizure of the stone; and Fig. 98 gives an idea of the natural size of its vesical end, which at the largest part is 42 millimetres in circumference. The entire length of this forceps is eleven inches.

I have since succeeded in constructing an improved lithoclast (Fig. 100), both jaws of which can be simultaneously opened by a slight addition to the mechanism of my first forceps (Figs. 97, 98, and 99), and whose beak is curved, so as to enable the surgeon to seize a calculus hidden behind the pubes. The

circumference of the vesical end at the largest part is forty-five millimetres, and consequently smaller than Mr. Dolbeau's instrument.

The manner of breaking up the stone with Mr. Dolbeau's forceps is as follows: After having ascertained the volume of the stone with the small lithotomy forceps, this instrument is removed, and the lithoclast, previously oiled, is introduced slowly and cautiously through the artificial canal into the bladder; the stone, if very large and hard, is gnawed by the teeth at the extremity of the lithoclast, so that it is destroyed from the circumference toward the centre, and when it is sufficiently reduced in size, it is caught between the jaws and broken up, considerable force being sometimes required to fracture it. Then fragment after fragment is seized and broken into portions sufficiently small to be extracted without injury to the vesical neck. When the calculus is not very hard and does not exceed an inch in diameter, it may be at once seized and crushed. Mr. Dolbeau was once able to reduce, at one crushing, such a stone to fifty-three fragments, all of which were small enough to be successfully extracted. Fig. 101 represents the lithoclast in position with a stone between its jaws. Large and soft stones can often be fractured with an ordinary pair of strong lithotomy forceps. In one

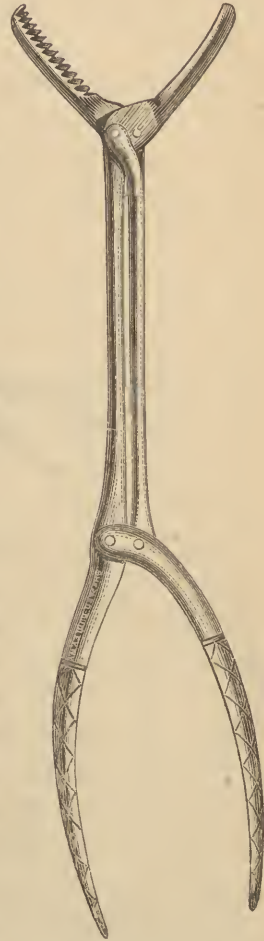


FIG. 100.—The Author's curved Lithoclast.

instance, recently, I was enabled to crush a calculus measuring one inch and a half in diameter with such an instrument. Fragmentation, with my lithoclasts, is done in the same manner.

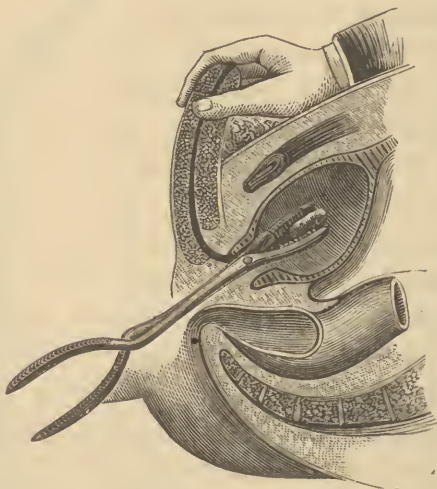


FIG. 101.—From Dolbeau, showing the lithoclast in position, with a calculus between its jaws.

3. Extraction is made partly with the lithoclast and small forceps, and partly with the scoop. The rules that apply to extraction after lithotomy should here be observed. It is, says Mr. Dolbeau, by a series of fragmentations and explorations followed by extractions, that the bladder is finally relieved of the calculous matter. He advises the injection of cold water into the bladder from time to time during these explorations, not for the purpose of washing away calculous debris, which would be impossible, but to control bleeding, and to render certain fragments more accessible. He insists that the patient must not be left until it is certain that there is nothing in the bladder, that therefore several explorations should be made with the small forceps through the wound, and also with a metallic sound of short curve introduced by the urethra.

The advantages claimed for the operation are : that the situation of the small wound exposes the patient to very little risk of hæmorrhage ; there is less suppuration, and the patient is less exposed to its bad effects, and in fact that it possesses all the advantages of median lithotomy without its disadvantages. Mr. Dolbeau urges that perineal lithotritry has not been with him an operation of choice, but of necessity ; that he has resorted to it only when lithotripsy by the natural route has been contra-indicated, and where the larger incision in perineal lithotomy might prove serious.

Among the accidents of perineal lithotritry he once observed complete retention of urine, a circumstance which went to show that the vesical neck had not lost its power of contraction. He states that pain in the hypogastrium and vesical and rectal tenesmus have not been infrequent consequences of the operation : the vesical tenesmus, in some cases, having been obstinate and annoying. He has never had to contend with severe bleeding. Rigors have sometimes occurred within the first few hours, rarely later. The supervention of a chill in three or four days may be regarded as a bad omen, perhaps the precursor of pyæmia. He has never had a case followed by permanent fistula. The wound has usually healed in from two to three weeks.

The after-treatment is the same as in lithotomy. Vesical and rectal tenesmus may be controlled by opium and belladonna given by mouth and in suppositories. A full dose of quinine and aconite should be given as soon as the patient can swallow, and it is well to take the precaution to administer a similar dose a moment before the operation. The administration of diluent drinks, the daily ablution of the bladder, and absolute cleanliness are not to be neglected.

Results of Perineal Lithotritry.—Taking into account the conditions which render the operation necessary, *i. e.*, a large cal-

culus, an irritable bladder, and other circumstances which contra-indicate lithotomy or lithotripsy, the results exhibited below may be considered eminently satisfactory. From 1863 to 1872, Prof. Dolbeau performed thirty operations with five deaths, or 1 in 6. In his first series of twenty-two cases he lost only two patients.

He gives the following analysis of these twenty-two cases. The ages ranged from 3 to 72. One case was a child 3 years old; three cases were subjects from 10 to 20 years; three cases from 30 to 40 years; four cases from 50 to 60 years; eleven cases from 60 to 72 years.

The chemical composition of the calculi was: 9, phosphatic; 8, uric acid; 4, oxalate of lime; 1, cystine. Nearly all of them were large, and in two cases were multiple.

In more than half of the cases the stone was too large or too hard to permit the application of ordinary lithotripsy, which had been tried, but could not be continued, owing to attacks of urinary fever.

In several cases lithotripsy was impossible, or would have been extremely difficult on account of organic complications, such as stricture of the urethra, enlarged prostate with retention of urine—in one case there was an enormous prostatic valvular outgrowth with severe cystitis.

In two cases there were multiple calculi, a circumstance which, added to other contra-indications, led to the abandonment of lithotripsy.

In the case of the child 3 years old, the operation was indicated by the presence of a large and hard (oxalate of lime) calculus.

My own experience in this operation is limited to three cases, which terminated favorably, and I have no hesitation to recommend it as preferable to median lithotomy with fragmentation of the stone.

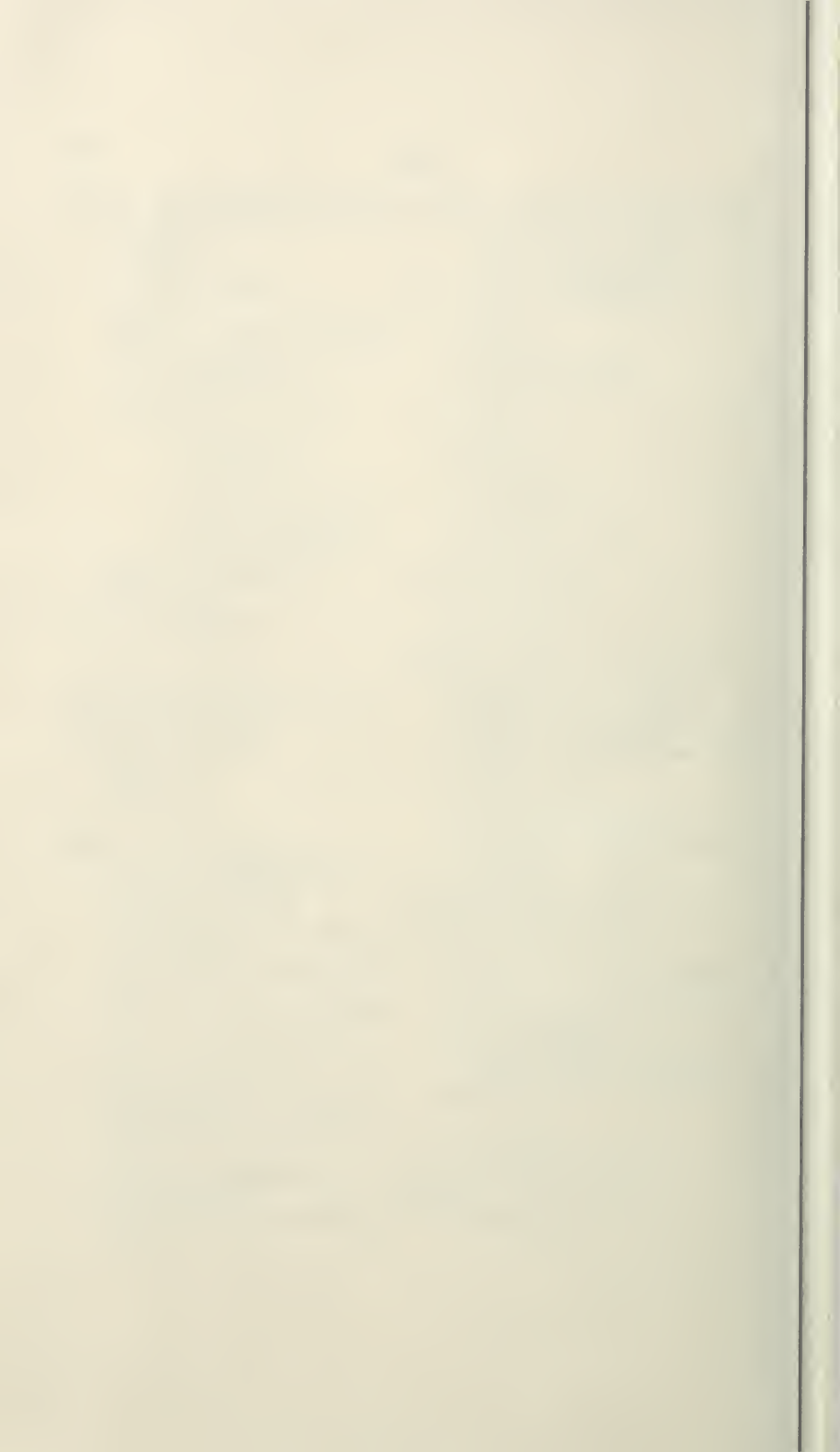
INDEX.

- ABSCCESS,**
 prostatic, 260.
 urethral, 13.
Accidents,
 of lateral lithotomy, 333.
 of lithotripsy, 318.
 of perineal lithotrity, 363.
Acute prostatitis,
 causes of, 259.
 diagnosis of, 260.
 termination of, 260.
 treatment of, 262.
Allarton,
 median lithotomy, 335.
Ammonia,
 muriate of, in treatment of cystitis and hypertrophy of prostate, 288.
Apparatus major, 321.
Atony of the bladder,
 from retention of urine due to stricture of the urethra, 226.
 in hypertrophy of the prostate, 289.
BEAKED BISTOURY,
 the author's, 125.
 Sir William Blizard's, 327.
Bell, Benjamin,
 abruptly bent bougies, 51.
 views of the pathology of stricture, 3.
Bell, Sir Charles,
 ball-probes, 19.
Bigelow, Dr. James,
 catheter syringe, 270.
Bistouri-caché,
 Civiale's, 81.
Bladder,
 concentric hypertrophy of, 15.
 laceration of neck of, from extraction of large calculus, 335.
 rupture of, 15, 244.
 wound of interior of in lithotomy, 333.
Bougies,
 knotted, 20.
 whalebone, 51.
Briggs', Prof.,
 lithotome, 344.
Buchanan, Dr.,
 on medio-lateral lithotomy, 342.
Bulbous bougie, 18.
 exploration of urethra with, 21.
CAUSTICS,
 treatment of stricture by, 55.
Catheter,
 tunnelled, the author's, 225.
Catheters, 23.
Catheterism, 28.
 accidents of, 31.
 in hypertrophy of prostate, 285.
 position of patient during, 29.
Chronic prostatitis,
 causes of, 264.
 diagnosis of, 266.
 treatment of, 268.
Charrière's
 urethrotome, 81.
Civiale's
 bistouri-caché, 81.
Civiale's
 urethrotome, 81.
Cock, Edw.,
 operation of tapping the urethra at the apex of prostate, unassisted by a guide staff, 232.
Cystectomy,
 Dr. Willis on, 349.
Cystitis,
 acute, 15.
 after lithotomy, 335.
 chronic, 15, 287.
DÉSORMEAUX',
 endoscope, 22.
Diagnosis of stricture, 18.
Dieulafoy's aspirator, 293.
Dilating urethrotome, Dr. Otis', 94.
Divulsion of strictures, 56.
 cases illustrative of, 62.
 indications and contra-indications of, 62.
 of pendulous portion of urethra, 68.
 upon conductor, 71.
 with conical sounds, 66.
 without conductor, 70.
Divulsor,
 Author's modification of Sir Henry Thompson's, 60.
 Holt's modification of Perrève's, 58.
 Voilemier's modification of Perrève's, 58.
Dolbeau's method of breaking large calculi in perineal lithotrity, 350.
 six-branched dilator for perineal lithotrity, 350.
Douglass, Mr. John,
 dilatation of fistulæ in perinæo with gentian and sponge tents, for the purpose of extracting vesical calculi, 349.

- ÉCRASEUR for ablation of median prostatic valvular outgrowths, 299.
- Electrolysis,
treatment of stricture by, 55.
- Endoscope, 22.
- External perineal urethrotomy, 112.
after-treatment, 127.
cases illustrative of, 129-132.
dangers of, 142.
estimate of the operation, 138.
history of, 112.
preparatory treatment, 127.
- Extravasation of urine, 239.
- FEVER, urethral, 33.
- Fisher, Dr. John D.,
instruments for illuminating dark cavities, 22.
- Fistulæ, urethral, 13, 242.
- Fragmentation of the stone during lithotomy, 349.
- GENERATIVE functions,
impairment of, from stricture, 14.
- Gorget,
Dr. Physick's, 325.
Sir Caesar Hawkins', 324.
- HÆMORRHAGE,
after external perineal urethrotomy, 142.
after lithotomy, 334.
- Holt, Mr. Bernard,
divulsor of, 58.
- Hutchison, Dr.,
catheter for applying ointments to the prostatic sinus, 270.
- Hydronephrosis, 15.
- Hypertrophy of the prostate, 273.
catheterism in, 285.
complete retention of urine in, 280.
diagnosis of, 281.
symptoms of, 279.
treatment of, 284.
- INFILTRATION of urine, 239.
after external perineal urethrotomy, 143.
after injury of the urethra, 183.
after lithotomy, 334.
from stricture of the urethra, 14, 239.
- Internal urethrotomy, 76.
from before backward, 85.
from behind forward, cases illustrative of, 91-93.
in sub-pubic curve and in pendulous portion of urethra, cases illustrative of, 83-85.
- JACOBSEN'S
brise-pierre articulé, 309.
- Jameson, Dr.,
urethrotome, 77.
- LATERAL lithotomy, 322.
accidents of, 333.
- Lee, Mr. Henry,
on medio-lateral lithotomy, 342.
- Leroy d'Etiolles'
bougies-à-boule, 18.
urethrotome, 82.
- Lithectasy,
Dr. Willis on, 349.
- Lithotome,
Professor Briggs', 344.
- Lithotome-caché,
Frère Cômé's, 324.
- Lithotomy, 321.
after-treatment, 332.
Celsian operation, 321.
Cheselden's operation, 323.
extraction of stone, 331.
first incision in, 330.
median, 335.
medio-lateral, 342.
results of, 344.
- Lithotripsy, 307.
accidents of, 318.
after-treatment, 318.
fragmentation of the stone, 315.
immediate removal of detritus, 317.
impaction of fragments in the urethra, 316.
mode of pulverizing fragments, 316.
position of patient during operation, 313.
results of, 319.
seizure of the stone, 314.
- Lithotriptor,
fenestrated, 311.
mode of introducing, 313.
modern, 311.
- Lithotritry,
perineal, 307.
Dolbeau on, 348.
lithoclasty in, 356.
- Little, Dr. J. L.,
on median lithotomy, 340.
- MAISONNEUVE'S
urethrotome, 79.
- Markoe Dr. T. M.,
on median lithotomy, 340.
- Meatotome,
the author's, 109.
- Meatus urinarius,
strictures at, 99.
chancrous variety, 101.
congenital variety, 99.
gonorrhoeal variety, 101.
traumatic variety, 99.

- Median lithotomy, 335.
 results of, 346.
- Medio-lateral lithotomy, 342.
 results of, 347.
- Median prostatic outgrowths,
 ablation of, 299.
- Muriate of ammonia,
 in treatment of hypertrophy of
 prostate, 288.
- NEPHRITIS, 15.
- Neuralgia
 of sciatic and other nerves of lower
 extremities from urinary diseases,
 16.
- Neuroses,
 urinary, 16.
- OTIS, Dr. F. N.,
 dilating urethrotome, 94.
 urethral speculum, 23.
- PARAPLEGIA,
 reflex, 16.
- Perineal lithotrity,
 dilatation of the urethra in, 348.
 incision of the urethra in, 348.
- Peri-prostatitis, 261.
- Peritonitis
 after lithotomy, 335.
- Physick, Dr.,
 gorget, 325.
 lanceted stilette, 76.
- Prostate,
 abscess of, 14.
 average measurements of healthy,
 275.
 fibrous tumors of, 276.
 hypertrophy of, 273.
 atony of the bladder in, treatment
 of, 290.
 cystitis and atony of bladder in,
 278.
 retention of urine from hypertro-
 phy of, management of, 290.
- Prostatitis, 14.
 acute, causes of, 259.
 diagnosis of, 260.
 symptoms of, 260.
 termination of, 260.
 treatment of, 262.
 chronic, causes of, 264.
 diagnosis of, 266.
 symptoms of, 265.
 termination of, 265.
 treatment of, 268.
 rostatorrhoea, 267.
- Puncture of the bladder
 with capillary trocars, in hyper-
 trophy of prostate, 292.
- Pyæmia,
 after lithotomy, 335.
 urethral, 38.
- Pyelitis, 15.
- Pyonephrosis, 15.
- RECTUM,
 wound of in lithotomy, 333.
- Retention of urine, 215.
 case of, caused by a single diseased
 kidney, situated in the pelvic
 cavity, 235.
 from hypertrophied prostate, man-
 agement of, 290.
 puncture of the bladder with ca-
 pillary trocars, combined with
 pneumatic aspiration in, 293.
- Retrograde urethrotomy,
 Civiale's, 80.
- Reybard's dilating urethrotome, 82.
- Rupture of the urethra and extrava-
 sation of urine, 239.
- SOUND gauges,
 metrical, 28.
- Sounds,
 conical, 26.
 curve of, 25.
 metallic, 24.
 mode of introducing, 30.
 tunnelled, 53, 226.
- Stevens, Dr. A. H.,
 prostatic bisector, 325.
- Stone in the bladder, 301.
 first and second explorations, 303.
 pathological effects of, 301.
 symptoms and constitutional ef-
 fects, 301.
 treatment preparatory to sound-
 ing, 302.
- Stricture of the urethra, 1.
 annular, 7.
 catheterism in eccentric, 50.
 causes of, 2.
 constitutional disturbances from, 16.
 constitutional treatment of, 41.
 definition of, 1.
 diagnosis of, 18.
 divulsion of with conical sounds, 66.
 eccentric, spiral bougies for pene-
 tration of, 51.
 abruptly bent bougies for penetra-
 tion of, 50.
 expansion of urethra in vicinity
 of, 12.
 extent of dilatation, 49.
 formative stage of, 5.
 forms and localities of, 6.
 incipient stage of, treatment in, 44.
 linear, 7.
 localities of, 8.

- Stricture of the urethra, management of difficult cases, 49.
 multiple, 8.
 pathology of, 3.
 progress of idiopathic, 9.
 second stage of, 6.
 sequelæ of, 12.
 slender probe-pointed whalebone shafts for penetration of, 51.
 spiral or tortuous, 7.
 surgical treatment of, 43.
 third stage of, 6.
 treatment of by caustics, 55.
 by dilatation, 47.
 by divulsion, 56.
 by electrolysis, 55.
 by external incision, 112.
 by internal incision, 76.
 by vital dilatation, 50.
- Strictures at meatus urinarius, 99.
 pathological effects, 103.
 treatment, 104.
- Suppression of urine, 37.
 treatment of, 39.
- THOMPSON, Sir Henry,
 exploring sound, 233.
- Traumatic lesions of the urethra, 172.
- Trélat's urethrotome, 81.
- Tunnelled catheter, 225.
 sounds, 53.
 staff, 226.
 urethrotome, 86.
- URETERS, distension of, 15.
- Urethra, arrest of gravel in, 173.
 accidents of catheterism of the, 31.
 contusions of the, 173.
 false passages in the, 31.
 lesions of, resulting from external violence, 176.
 loss of substance of, from gangrene, 174.
 prolonged retention of catheters in, 174.
 rupture of, and extravasation of urine, 14, 239.
 stricture of, constitutional treatment of, 41.
 surgical treatment of stricture of transverse lacerations of the, 173.
 the, 43.
 treatment in incipient stage of stricture of, 44.
 treatment of stricture of by dilatation, 47.
- Urethra, traumatic lesions of the, 172.
 traumatic lesions of, which are followed by stricture, 172.
 traumatic lesions of, which are not followed by stricture, 172.
- Urethrotome, Charrière's, 81.
 Civiale's, 77.
 Gross', 79.
 Jameson's, 77.
 Leroy (d'Étiolles), 82.
 Maisonneuve's, 79.
 Mastin's, 79.
 Pancoast's, 79.
 Trélat's, 81.
 tunnelled, 86.
 Voilemier's, 79.
 Westmoreland's, 79.
 dilating, Dr. Otis', 94.
 Reybard's, 82.
 the author's, 97.
- Urethral fever, 33.
 treatment of, 38.
 pyæmia, 38.
- Urethritis, granular, 5.
- Urethroscope, 23.
- Urethrotomy, external perineal, 112.
 cases illustrative of, 146-171.
 internal, 76.
 from before backward, 85.
 indications and contra-indications of, 93.
 in pubic curve, 83.
 Maisonneuve's method, 79.
 Voilemier's method, 79.
 with tunnelled urethrotome, cases illustrative of, 86-91.
- Urinary fever, 33.
 after lithotomy, 334.
- Urinary secretion, alterations in, 11.
- Urine,
 extravasation of, 239.
 infiltration of, after lithotomy, 334.
 microscopic examination of, 20.
 retention of, 11, 215.
 retention of from hypertrophied prostate, management of, 290.
 suppression of, 73.
 treatment, 39.
- WALTER, Dr. A. G.,
 on median lithotomy, 340.
- Whalebone conductors, 225.
- Willis, Dr.,
 on lithectasy, 349.







Bridgeport
National
Bindery, Inc.

MAR. 1983

"Sound to Last"



NLM ~~05109879~~ 2

NATIONAL LIBRARY OF MEDICINE